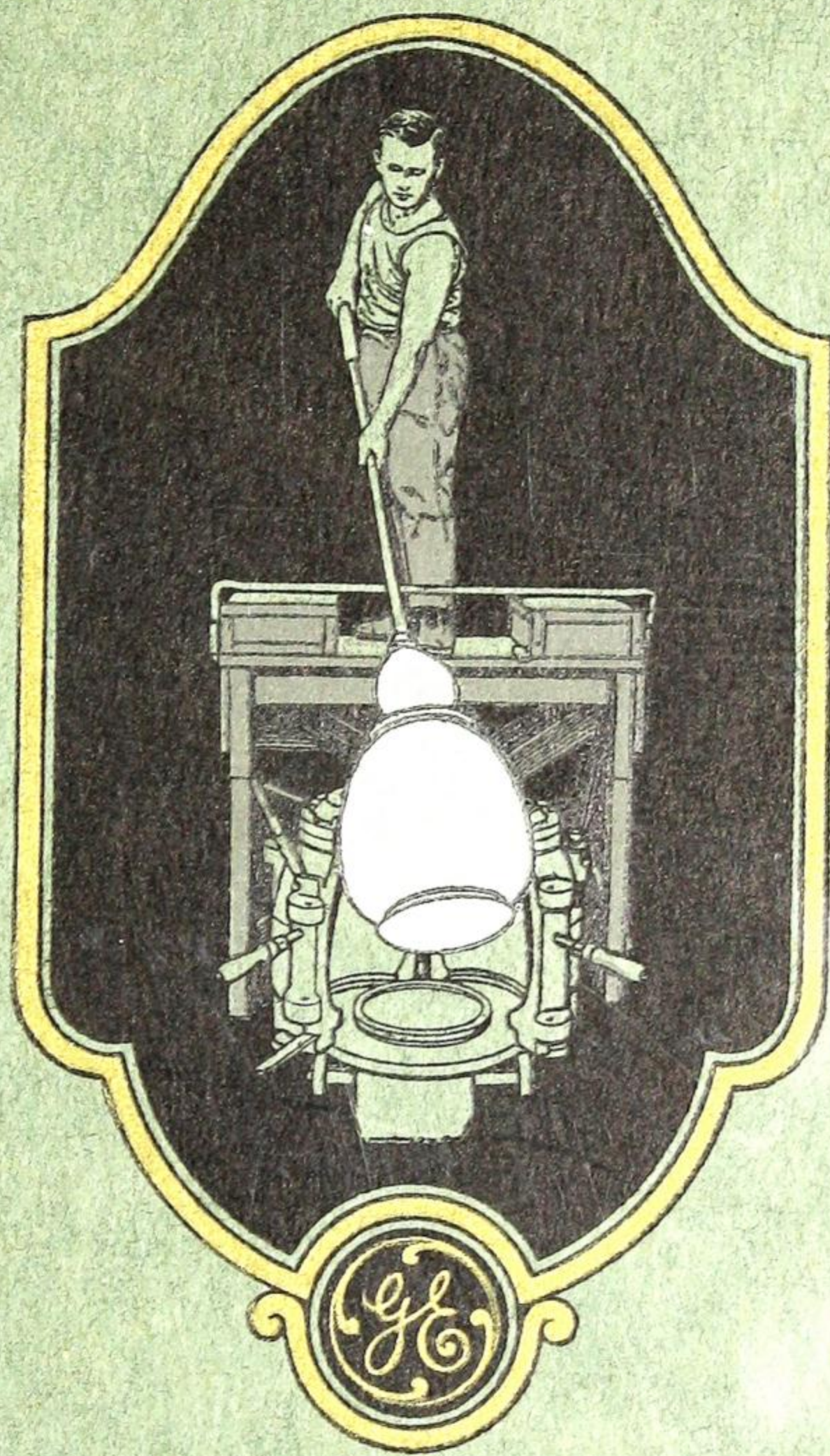
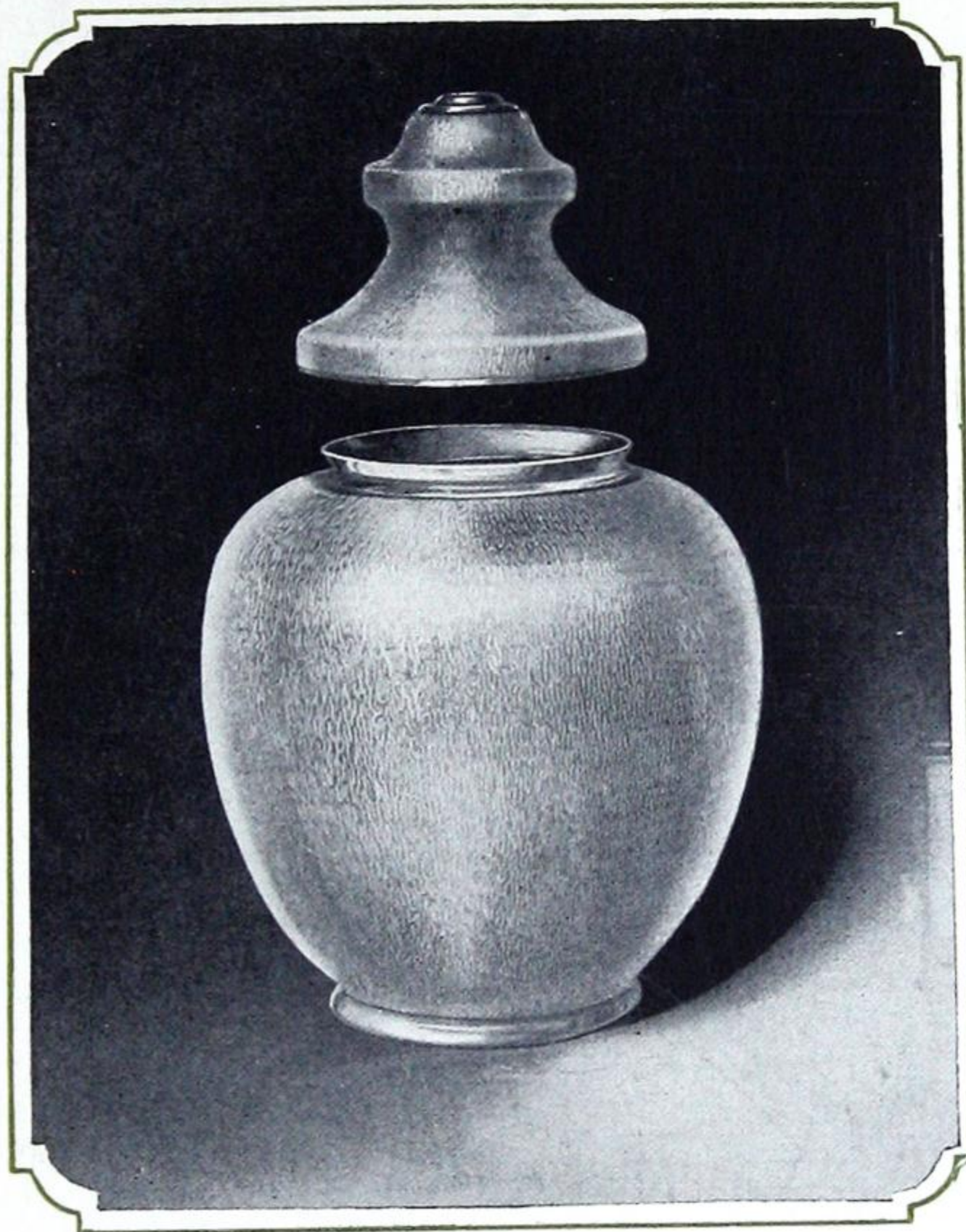


STREET LIGHTING GLASSWARE



GENERAL ELECTRIC

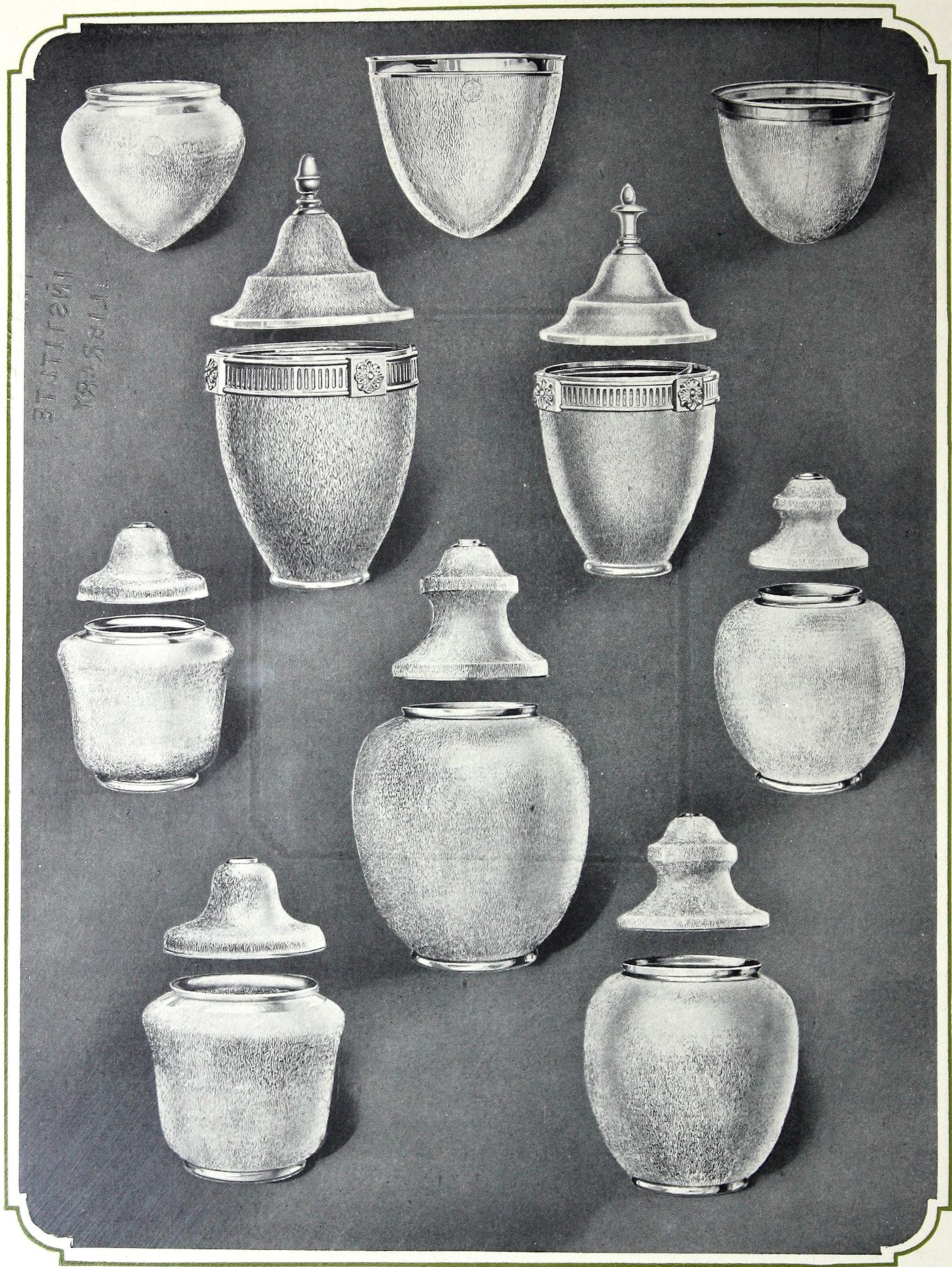
STREET LIGHTING GLASSWARE



GENERAL ELECTRIC COMPANY
SCHENECTADY, N. Y.

September, 1925

Bulletin GEA-103



Typical General Electric Street Lighting Glassware

Introduction

Glassmaking is one of the oldest industrial arts, but the date of its invention and the nationality of its discoverer are matters of speculation. The earliest records which contain any reference to the manufacture of glass indicate that it was probably known 6000 to 5000 B.C. At a somewhat later date, the art was apparently highly developed in Egypt, but the use of glass was then largely confined to objects of a very ornamental nature and restricted application.

With the reintroduction of glassmaking in the Western World at the beginning of the Renaissance, Venice secured a commanding position in this art. There glass really began its career of everyday usefulness. The magnificent goblets of Venetian craftsmen were soon in demand throughout the civilized world. Bohemia then produced a glass of exceptional clearness, but it lacked the lustre and beauty of the Venetian ware. It remained for modern civilization, however, to multiply the uses of this substance, and develop process as well as product to a high degree of perfection.

The value of glassware will be appreciated when one estimates its importance to research and manufacture in almost every branch of science and industry. Without the coincident development of glassmaking, many of the most essential arts and crafts would, as yet, have failed to reach any degree of practical service.

Glass is historically credited with being first adapted to street lighting service at Paris, in 1594. Since that time, this use of glass has been rapidly increasing, until it is now a paramount requisite for public illumination. At first it was probably used to prevent the wind from extinguishing the taper or oil lamp and so to maintain service. With the successive inventions of better illuminants, glass has been made to serve many purposes, but each has had for its object the improvement of the quantity and quality of light. Street lighting glassware continues to serve this purpose, and more efficiently and thoroughly than ever before. It is now designed to achieve various effects in the distribution of light: to diffuse the light over a large area; or to direct it in the most economical manner; and frequently the globe acts as a secondary light source, hiding the primary glare. Now, too, glassware is designed to be ornamental—it must be in harmony with the surroundings.

All the artistry of those Venetian craftsmen has been reborn in General Electric Glassware, but the new product has lost the fragility and elaboration of the old, for modern scientific research has added features of strength and increased usefulness. Leading architects design the forms of G-E Glassware, while eminent scientists closely follow the manufacturing processes by which these designs are applied, and analyze the ingredients in order to assure entire conformity to the highest standard. When the design has at last taken material form, the glass is thoroughly annealed, which enables it to withstand sudden changes in temperature and gives it requisite strength. Now ready for its ornamental and utilitarian service, the glistening globe is carefully packed by an entirely new method which has reduced breakage to a seemingly impossible minimum.

The impetus given ornamental street lighting in the last few years has demanded the creation of artistic glassware to adorn the light standards. To satisfy these requirements, General Electric Street Lighting Glassware, to which this publication is devoted, has been developed to its present point of beauty and utility.

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Importance of Glassware to Street Lighting

The satisfaction given by an installation of street lighting depends to a great extent upon the type of glassware used. Clear plain glass, with its many faults, has been definitely ruled out and several factors now enter into the selection of the proper glassware. The most important of these are suggested in the following questions: *Form*: Has it a pleasing appearance when lighted? Does it harmonize with the fixture to which it is attached, and also with its surroundings? In other words, is it correctly designed from the artistic standpoint? *Surface Texture*: Is the surface so designed as to give a sparkling, lively tone to the light, or has it a flat, dead quality? *Diffusion*: Does the glassware reveal the light source as a bright, glaring spot, or as a diffused area extending over the entire surface of the globe, completely preventing eye strain? *Maintenance*: Is the globe tough and strong, able to withstand hard service and the elements, or is it fragile and easily broken by exposure? That is, is it carefully manufactured? Moreover, does it collect dirt, and is it easy to clean?

Street lighting glassware may be a source of civic pride or the subject of public derision. An artist may design magnificent globes and lanterns, but the units must be highly efficient; they must not waste light and hence the tax-payers' money. Let us note how the General Electric Company has sought to effect this balance and how it has achieved success.

Form

General Electric Glassware is constructed for architectural beauty as well as utility. The globes are artistically designed to harmonize with the ornamental standards or brackets on which they are mounted. Various kinds of glass are available so that at least one can be found which is exactly applicable to the given set of conditions. Globes must present an artistic appearance in the daytime when they are seen as only a part of the lighting fixture; while at night, when they become centers of interest, they must create an equally good impression.

Surface Texture

Rippled glassware—a General Electric development—gives an incandescent light-source the appearance of sparkling light. The small irregular vertical ridges, that break up the globe surface into spots of brightness and semi-brightness, seem to alternate as one passes by when the lamp is in operation. This gives a sparkle to the unit that is entirely lacking when a plain globe is used. Through the cooperation of physicists, experts in light, this highly desirable effect has been produced at a negligible loss in efficiency of the lighting unit.

Diffusion

The concealment of the glaring light source has been accomplished in two ways. Translucent glass completely hides the blinding lamp, and makes the globe a secondary light source devoid of glare. Rippled clear glassware conceals the light source behind a sparkling crystal wall having a generally soft texture with central points of high bril-

liancy spread over a considerable area. The irregular form of the ripples prevents the appearance of any fixed geometric pattern and produces a highly interesting effect.

Maintenance

The careful manufacturing process to which all G-E Glassware is subjected insures the globe against breakage from any sudden temperature change and against ordinary shock resulting from careless handling or a flying missile.* The arrangement of the ripples in a generally vertical direction leaves no horizontal flat surfaces on which dirt may collect. An occasional rain serves to keep the globe fairly clean. When water is sprayed or poured over the globe in order to clean it, the dirt is washed away by the minute streams that form in the troughs of the ripples, and thus the whole surface is cleansed as the water cannot pick its path of descent. Should this method be considered insufficient and a brush deemed necessary, the bristles of the brush will concentrate in the depressions between the ripples and so will readily remove the dirt. The ripples also conceal any streaks left by water when running off the globe, that might show on the surface of smooth glass.

Manufacture

The constituents usually combined in manufacturing glass consist of some form of silica sand, an alkali flux such as potash or soda ash, and some form of lead, aluminum, or zinc. These materials are combined in furnaces or tanks by the continued application of heat at an intensity of 1600 to 3000 degrees F., for periods varying, for different kinds of glass, from 12 to 36 hours.

Molten glass is formed into various shapes by two distinct methods—by hand and in moulds. Hand-made glass is gathered from the furnace and is manipulated into the desired shape by the worker without the aid of any confining or forming apparatus. Moulded glassware receives its final shape from a mould or confining device into which the glass is blown.

The glass blower thrusts the end of a six-foot steel blow pipe into the crucible containing molten glass, gathering as much material on it as is necessary. By blowing through



Fig. 1. Smoothing the Outside Surface of the Glass Globule with Wooden Forms

*No glass has yet been made which will withstand all the abuse to which street lighting glassware is subjected. Therefore, it is sometimes necessary to replace broken globes. As street lighting installations are designed to employ specific globes, it is imperative that replacements be identical with those originally furnished, if the appearance of the system and its high operating efficiency are to be maintained. To simplify the selecting of replacement glassware, a form, in duplicate, is supplied to all purchasers. This enables the correct globe always to be used on the lighting unit.

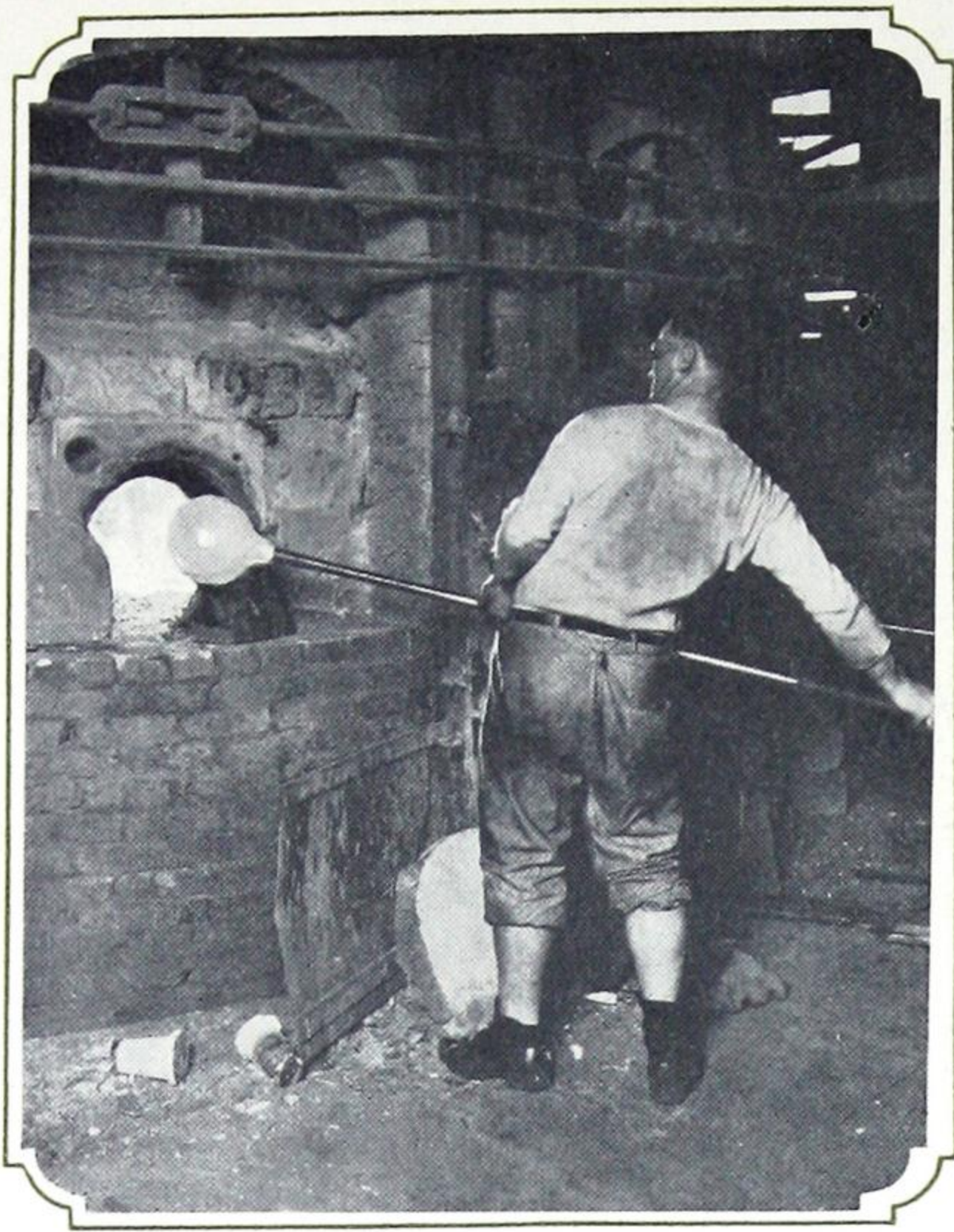


Fig. 2. Removing the Glass Globule from the Furnace after about Four Gatherings

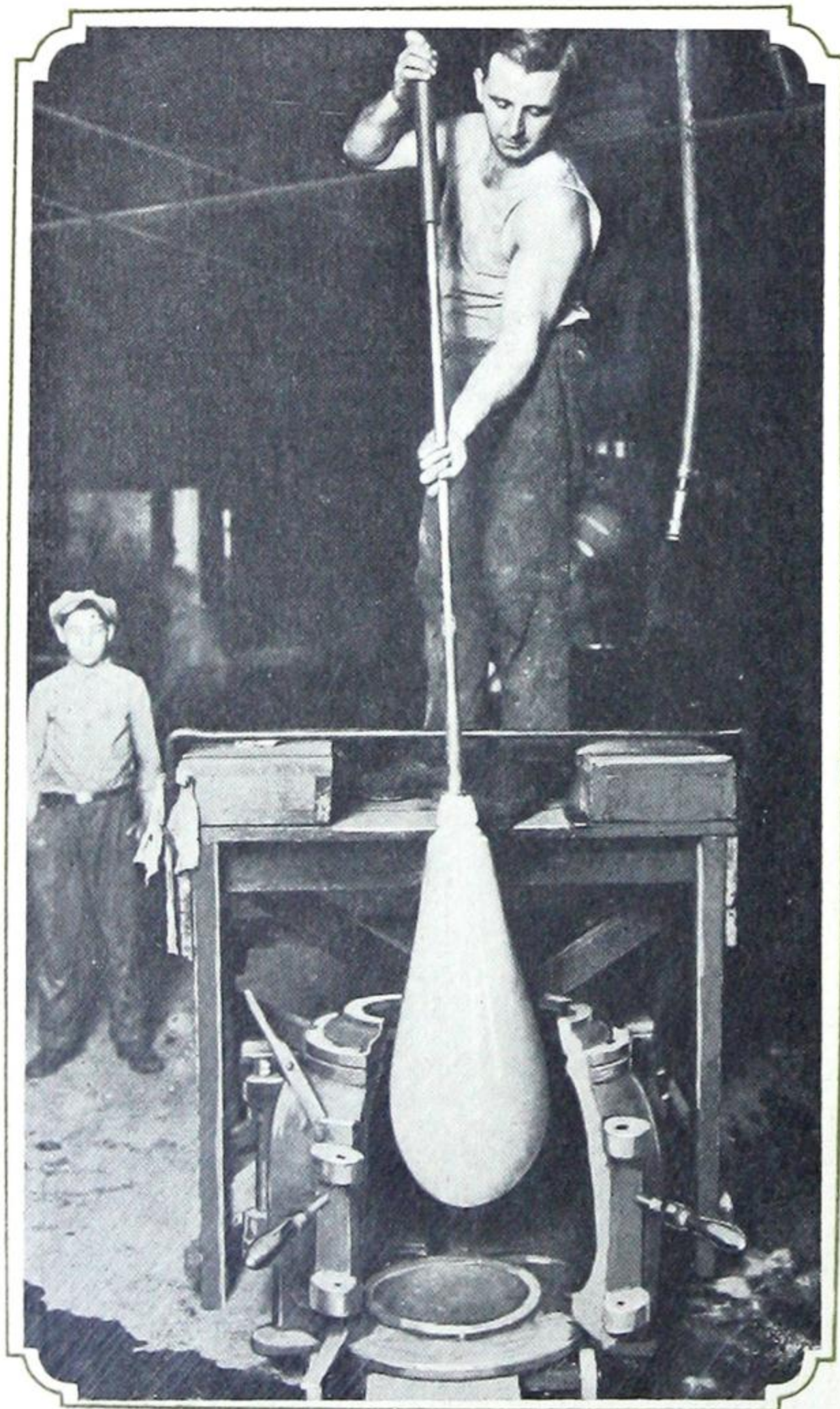


Fig. 3. Placing the Globule in the Mould

the pipe, pressure is exerted upon the inside of this ball of glass, and a hollow globule is formed. This globule is slowly revolved until its walls are of about uniform thickness, while its outside surface is smoothed by use of wooden forms. This operation is illustrated in Fig. 1 on page 5. The globule is built up to the desired size by repeated gatherings of the molten glass, expanding it by blowing, and smoothing it off. Fig. 2 shows the globule being removed from the furnace after about four gatherings. When the required size is reached, it is placed in the mould, as shown in Fig. 3, the mould is then clamped shut, and air is applied to the globule to force it into the shape of the mould. When the glass has solidified sufficiently to retain the globe shape, it is taken out of the mould. In Fig. 4 the No. 108 globe is being removed from its mould.

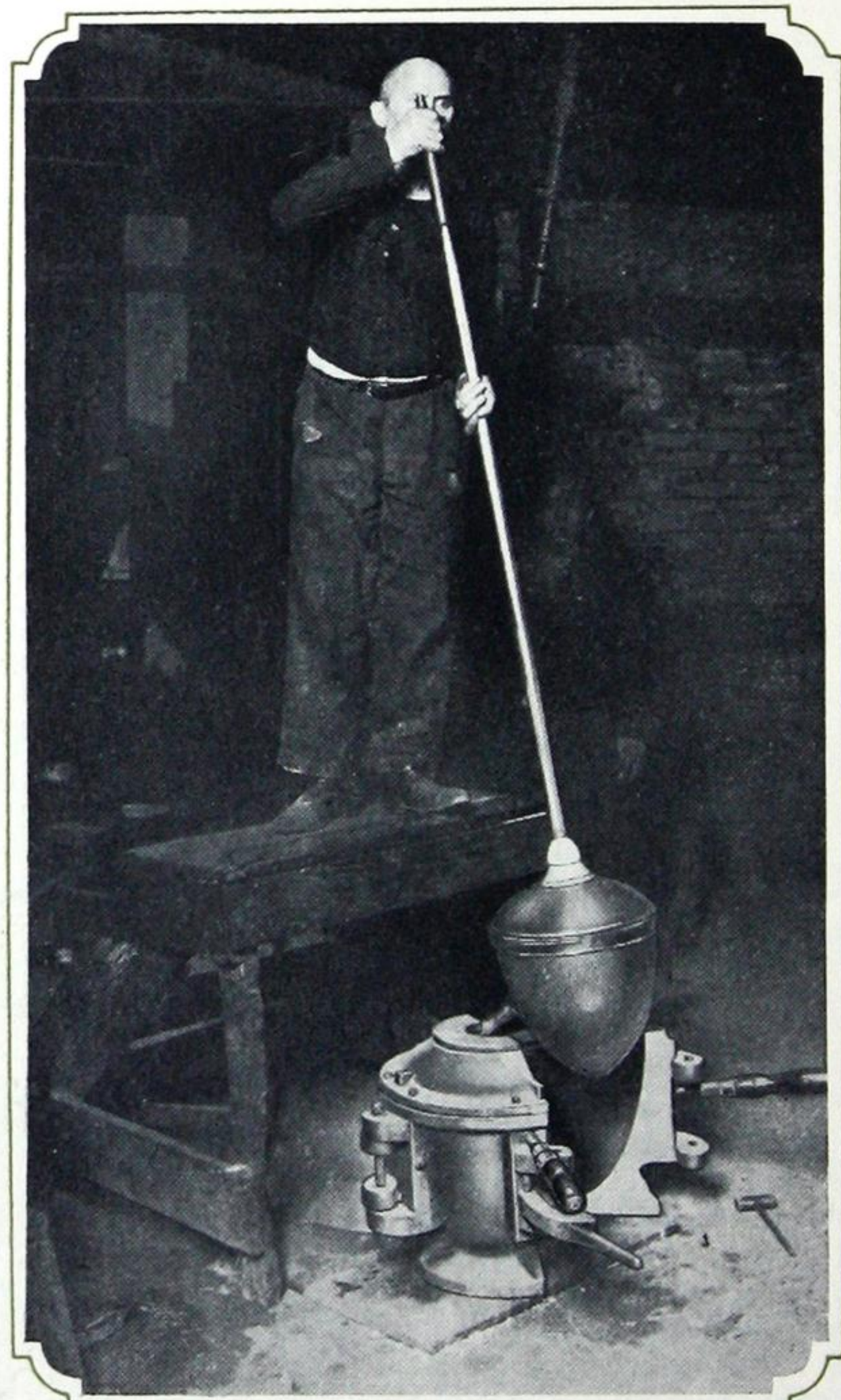


Fig. 4. Removing the No. 108 Globe from its Mould

Moulds

There are three kinds of glass moulds: iron, paste, and press moulds. These derive their names from the manufacturing processes involved and not from their construction, for all three are made of iron.

Iron Mould

Iron moulds are made of two or more sections joined on one side by a hinge and on the other side by some type of clamps or locks. The inside of the mould is polished so that the surface of the finished article will be as smooth as possible. In Fig. 5 the mould for the No. 126 rippled globe is shown closed, while Fig. 6 illustrates this same mould opened.

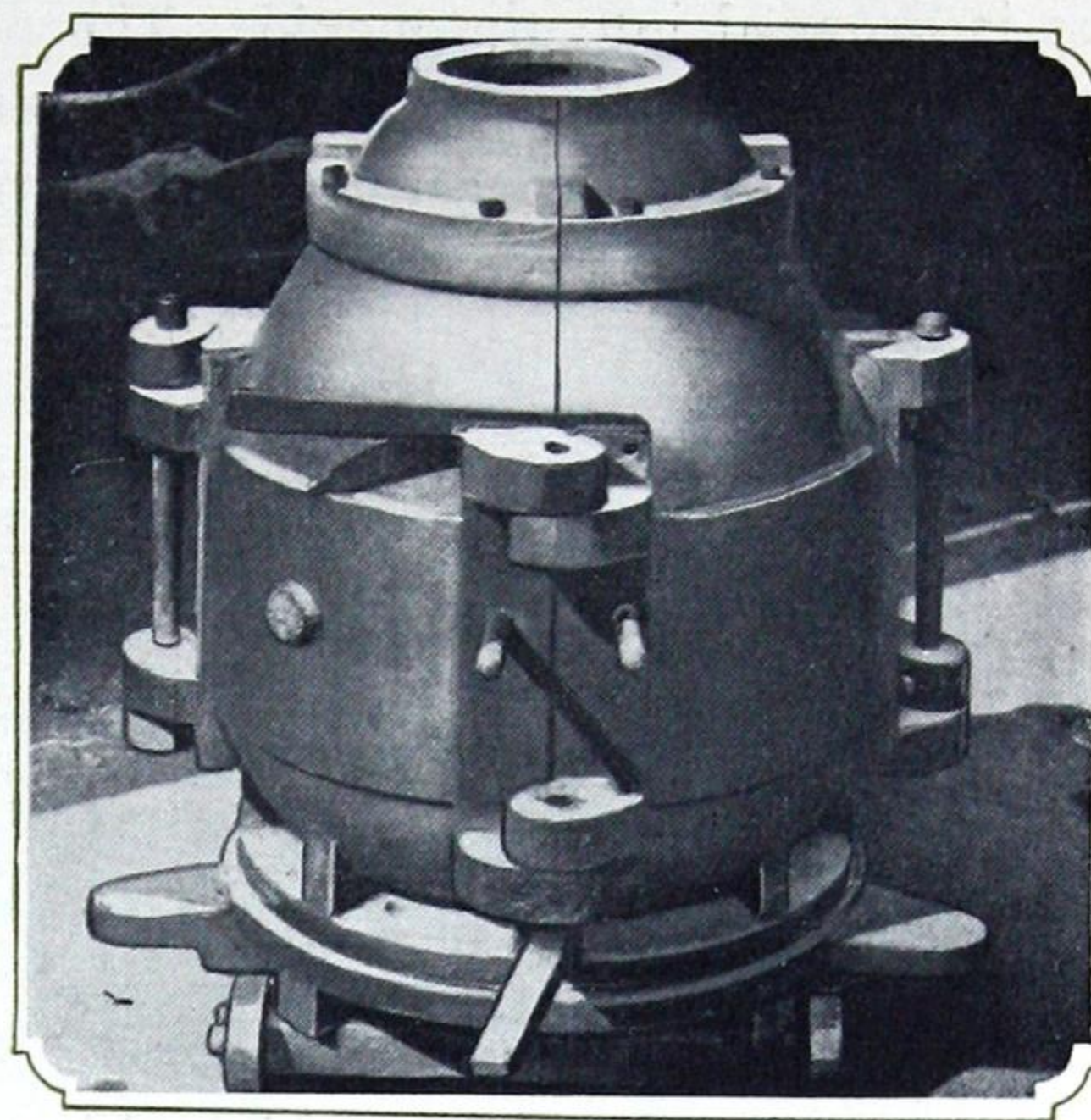


Fig. 5. Mould for the No. 126 Rippled Globe Closed

Paste Mould

When glass objects are blown in iron moulds and are not revolved in the moulds, slight ridges form where the sections of the mould join. The formation of these ridges can be avoided, when the surface of the globe is to be perfectly smooth and the globe-shape is such that any horizontal cross section will reveal a perfect circle, by covering the mould surface with a paint, composed principally of carbon, that acts as a lubricant allowing the globe to be revolved inside the mould until it is solidified to a sufficient extent to be removed.

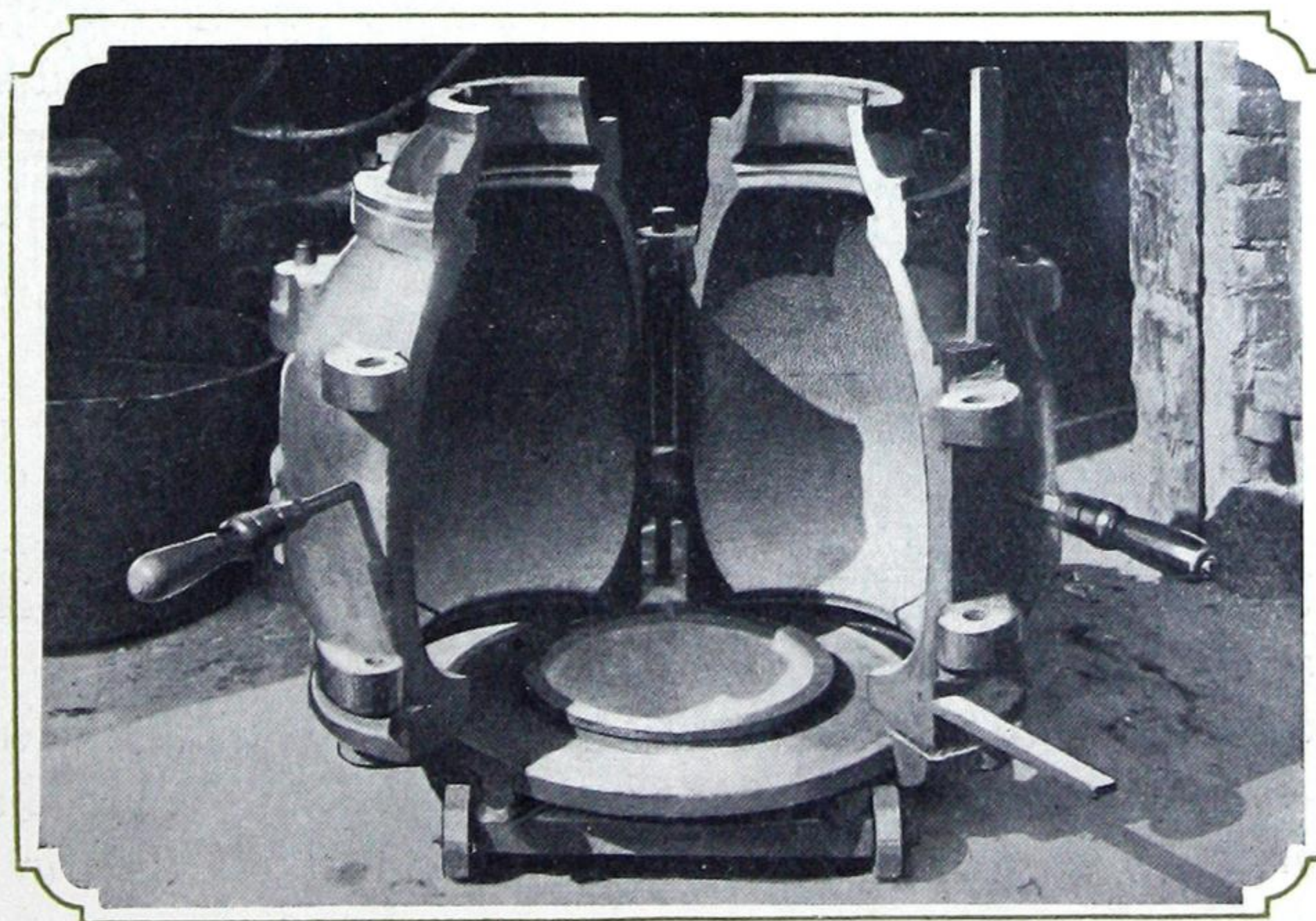


Fig. 6. Mould for the No. 126 Rippled Globe Opened

Press Mould

The press mould consists of two parts, the mould proper and the plunger. Molten glass is dropped into the mould. The plunger is inserted and pressed down, thereby forcing the molten glass into the space between the plunger and the mould. Care must be exercised to put in exactly the right amount of glass, so that there will be enough to fill the mould but not run over.

Annealing

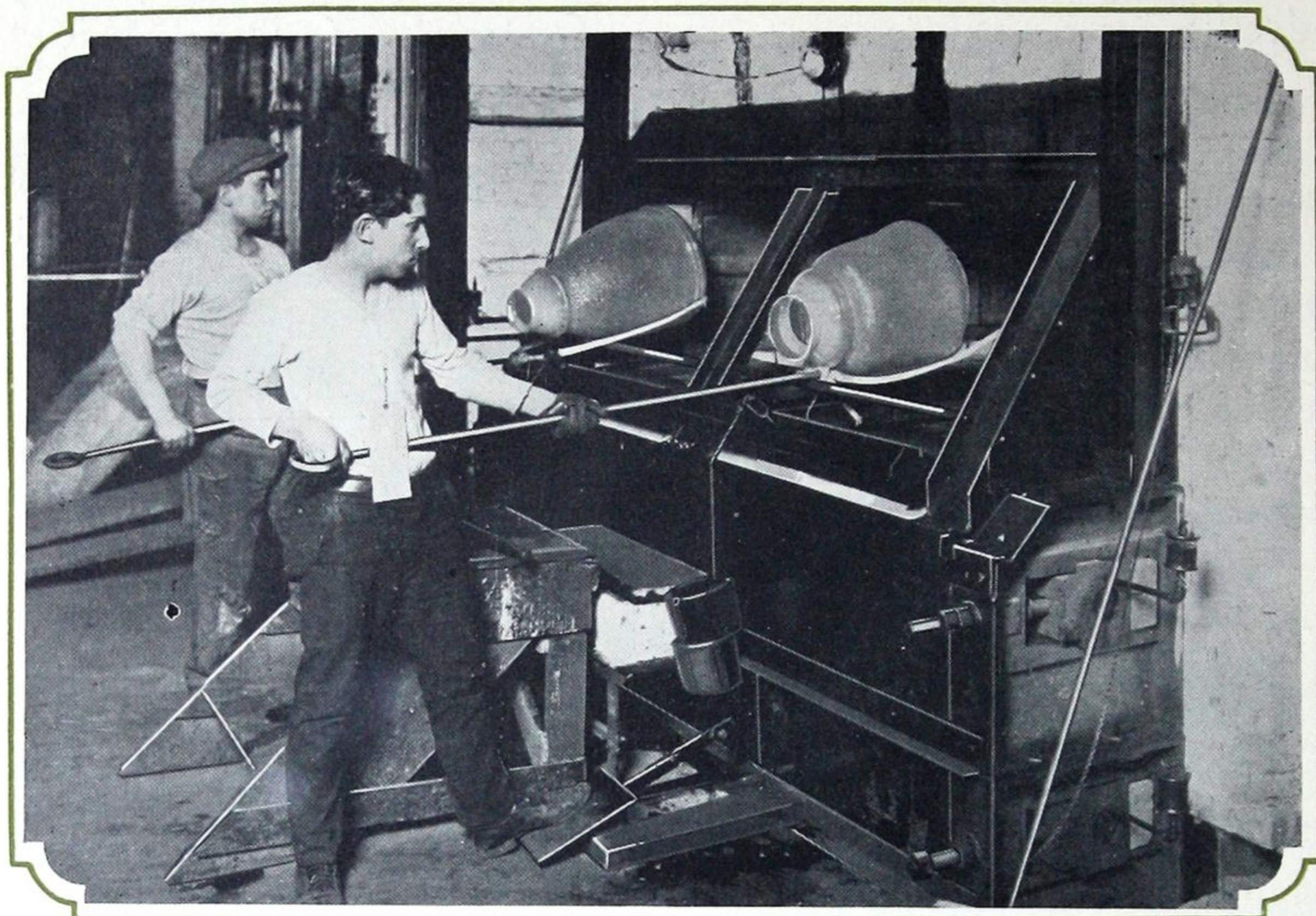


Fig. 7. Operators Placing a No. 124 and a No. 107 Globe in the Leer or Annealing Oven. The Globes are Drawn Through the Leer on an Endless Belt

Glass which has been cooled too quickly after being blown is fragile, and will break easily when subjected to sudden temperature changes, such as are caused by rain or snow falling on a heated globe. This brittleness is prevented by tempering, annealing, or leering, as the process is variously called. After the glass has been formed into the desired shape, it is placed on an endless belt, illustrated in Fig. 7, which is drawn through an oven of considerable length. As the individual pieces of glass are carried through this leer, they pass through sections that are heated to higher and higher degrees of temperature, until finally a point is reached which is just below the melting point of glass. From this section of the leer, the heat gradually decreases to room temperature. Fig. 8 shows the cold end of the leer. This annealing tends to relieve all strains and internal stresses in the glass and also removes most of its brittleness.

When the globe shapes are taken from the annealing oven or leer, the ends are cracked off, leaving only the globes. This is accomplished by placing the globe shape, with its axis perpendicular, on a revolving table. A small gas flame is then impinged against the globe at the point where the superfluous glass is to be cracked off. As the globe is turned on its revolving support, a narrow ring of the glass is heated. When this ring is



Fig. 8. Street Lighting Globes at the Cold End of the Leer

hot enough, it is scratched slightly with a piece of carborundum. The scratch causes the glass to crack, the crack following the hot ring all the way around the globe, separating it from the end-piece or overblow. The globe is shown on the cracking-off table in Fig. 9. The operator is scratching the lower hot ring with a piece of carborundum.

When the ends have been cracked off, the edges are ground smooth on a large revolving iron wheel, placed with its axis vertical, sand and carborundum dust being used as a grinding flux. Workmen can be seen in Fig. 10 grinding the edges of a No. 1124 Canopy and two globes, No. 104 and No. 127.



Fig. 9. Workman Cracking Off the Bottom Overblow from the No. 118 Globe



Fig. 10. Grinding the Edges of a No. 104 Globe, a No. 127 Globe, and a No. 1124 Canopy

Packing

One of the many reasons for the superior service of General Electric Glassware is the care with which it is packed. Many years of experience with the rough handling to which objects, similar in size and weight to those containing G-E Glassware, are subjected by indifferent or careless freight handlers, led to the testing in all conceivable ways of cartons of different design, construction, and material, packed with glassware, in order to ascertain which would best protect the contents from damage. The cartons now in use, which are constructed of double-face corrugated cardboard, are resilient as well as strong. They will stand a compression test of 275 lb. per square inch, and are of such a shape and size that they can be packed neatly and safely in large quantities for shipping.

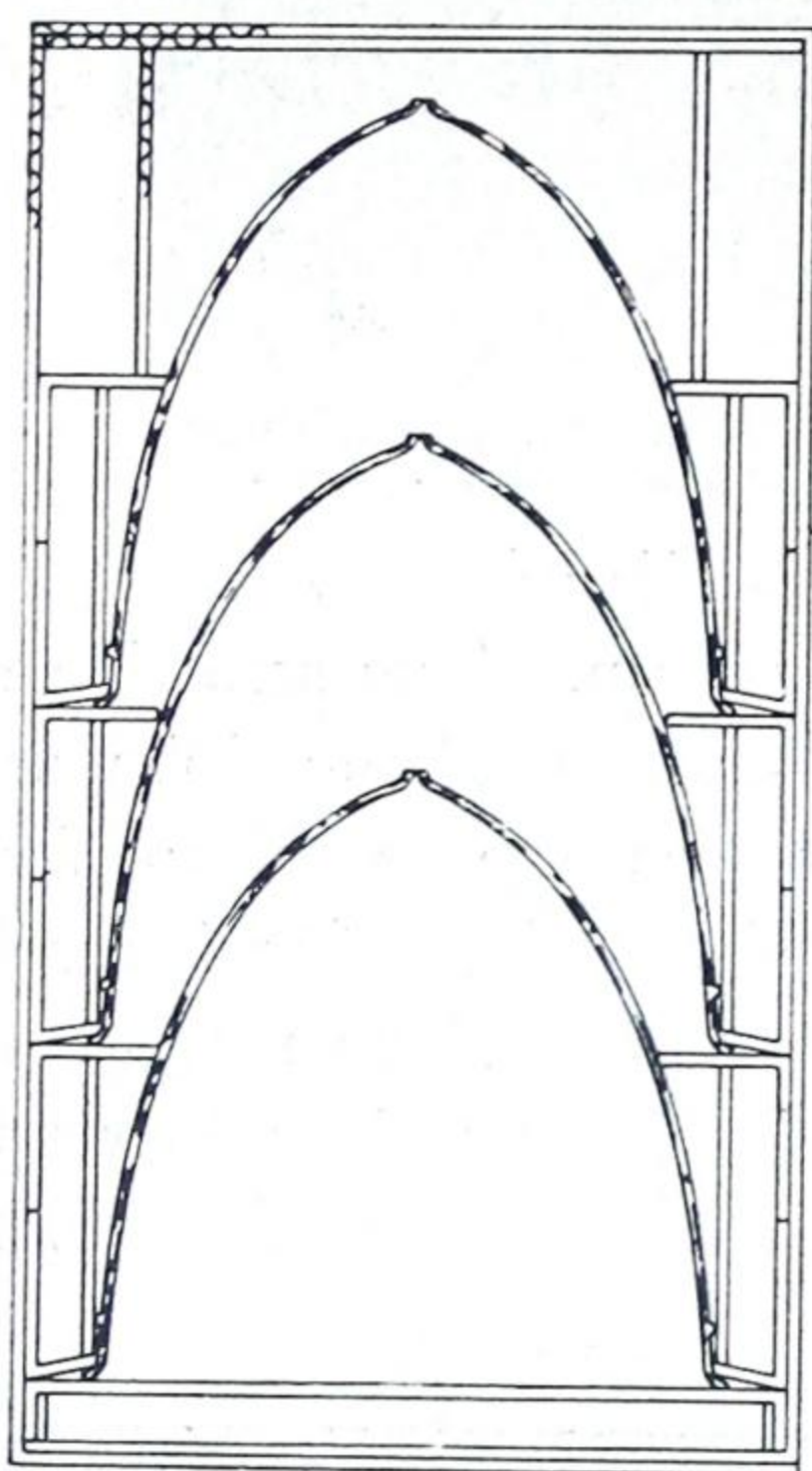


Fig. 11. Cross-sectional Sketch of Corrugated Cardboard Carton

Packing is done with the idea of protecting, to as great an extent as possible, all the pieces of glass contained in the carton. If one piece should be broken, the others are not in so much danger of also being broken as in other methods of packing. The cartons are made large enough to leave a space of $1\frac{1}{4}$ inches on each side between the globes and the walls of the cartons.

Taking the No. 108 globes as an example, the packing is done as follows: In the bottom of the carton, a strip of cardboard bent to form a square is placed so that its corners are in the center of the sides of the carton. On top of this is placed a filler with its edges turned down so that it makes a tight fit with the bottom of the carton when pressed down. The globe is then put in, with its open side down. A filler with a hole cut in it the full size of the globe, and with its edges turned up, is next added. A ring of cardboard large enough to fit easily around the globe is then put in place, followed by a filler having its edges turned down and containing a smaller hole corresponding to the decreased diameter of the globe near the tip. A filler having its edges turned up and with the same size hole as the preceding one is put in and the next globe is set on top of it. From this point on, the process is repeated until all three globes are in place. A strip of cardboard, similar to the one put in the bottom and formed into a square, is placed between the last filler and the top of the carton, which is closed in the customary way with paste and gummed strips.

The accompanying cross-sectional sketch, Fig. 11, and illustrations of some opened cartons, Figs. 12 to 15, give a further description of the method used in packing the glassware. The edges of the fillers are made of such a length that when the carton is closed they will all fit tightly together and form a solid wall the full depth of the carton. The space left between the walls and the globe insures additional safety to the glassware should a freight handling hook pierce through both outside walls of the carton.

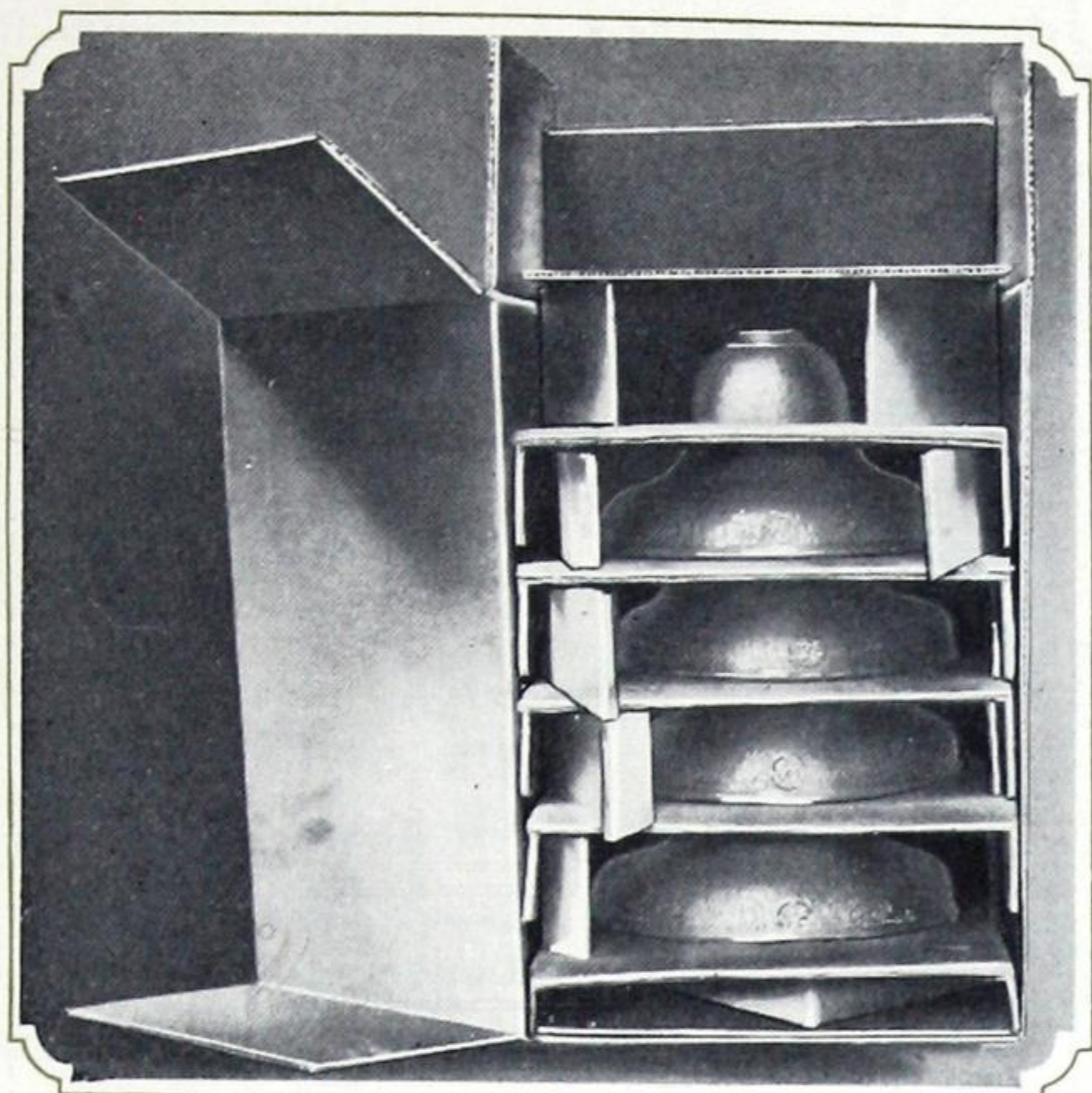


Fig. 12. Carton Cut Open, Showing Method of Packing Four No. 1109 Rippled Canopies

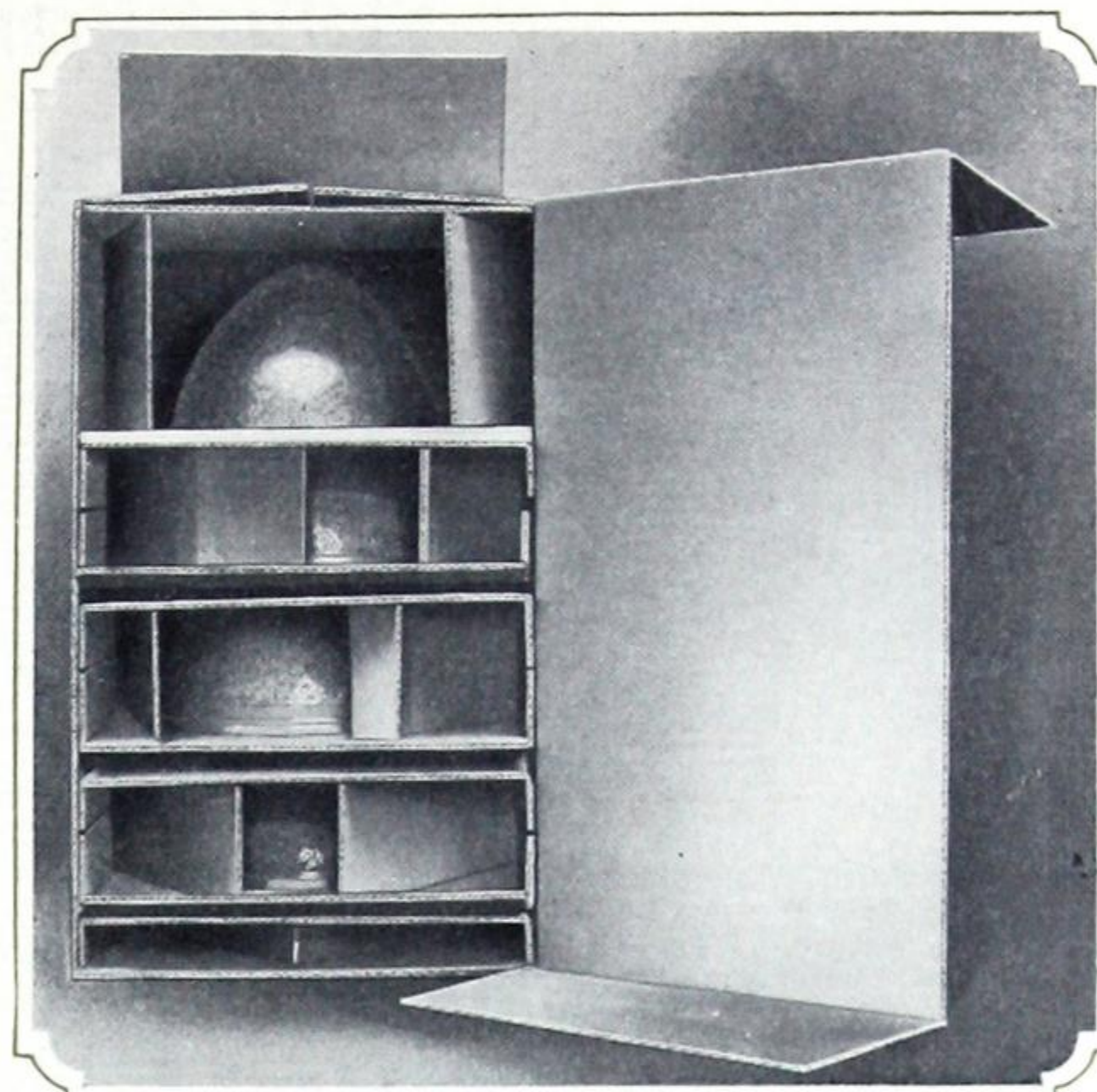


Fig. 13. Method of Packing Three No. 108 Rippled Globes. Carton has been Cut Open

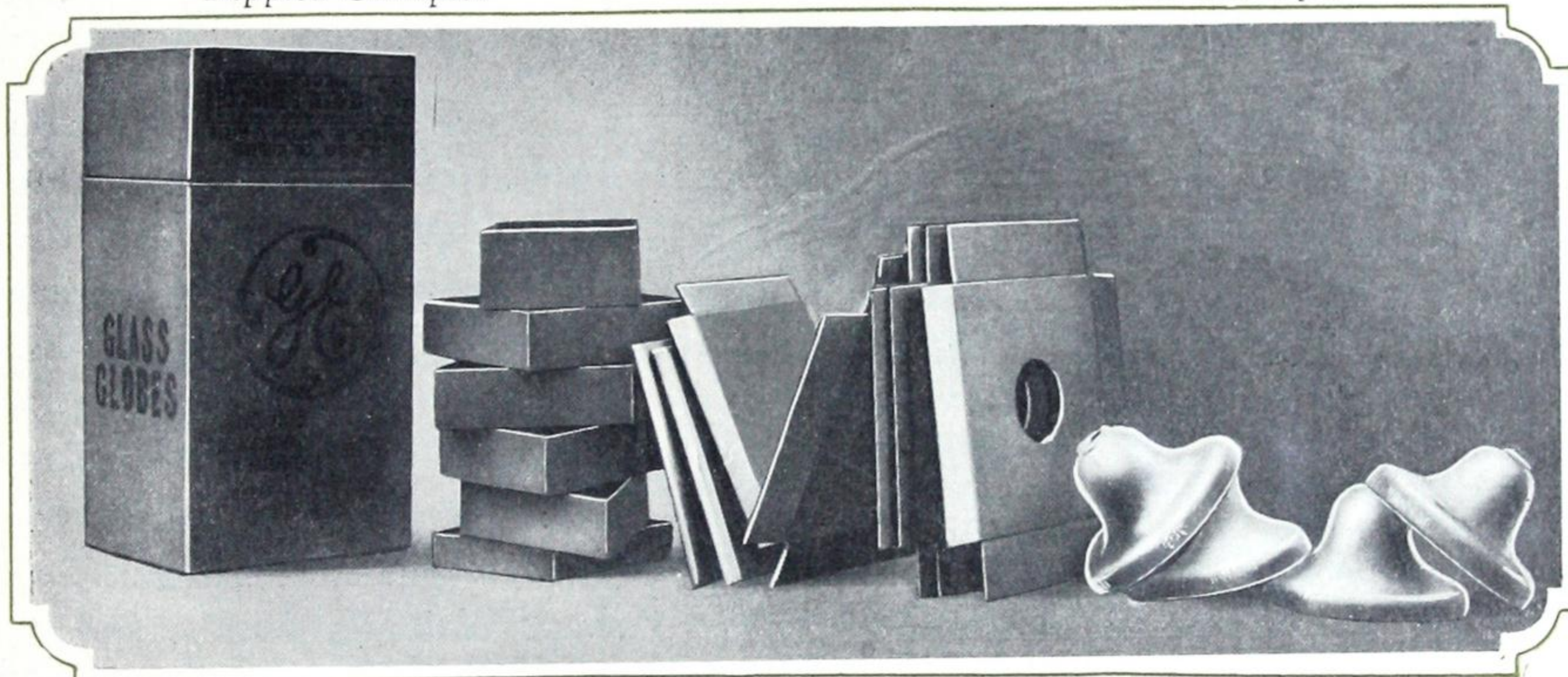


Fig. 14. Disassembled View of the Corrugated Cardboard Carton in which Four No. 1109 Canopies are Packed

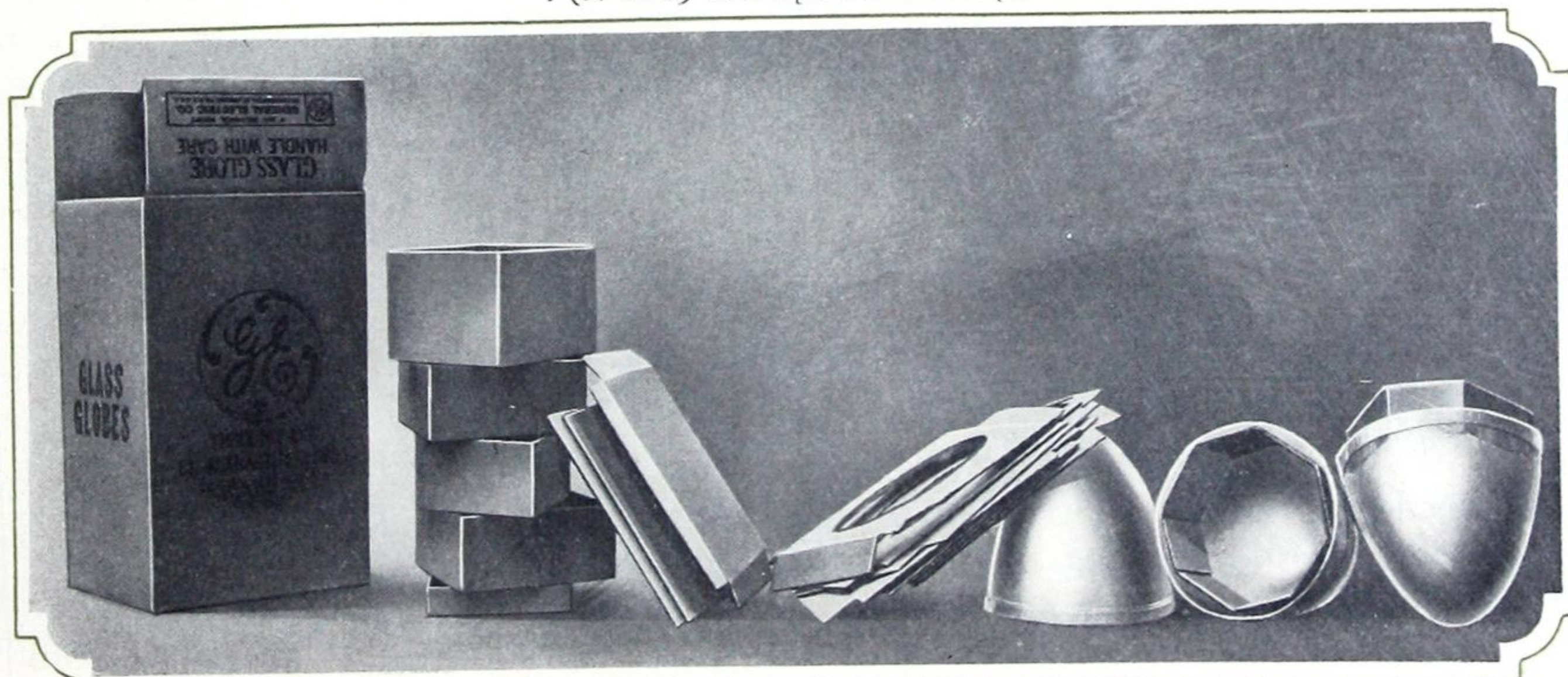


Fig. 15. Disassembled View of the Corrugated Cardboard Carton in which Three No. 108 Globes are Packed

Holophane Refractors

Of the light dispersed by a bare lamp, about 50 per cent goes above the horizontal. Except in the intensive lighting of business districts, and in certain other installations, where the illumination of the front and upper stories of buildings is highly desirable, this upward light is wasted. For main thoroughfares and residential streets, the redirection of this upward light to the street would represent a saving and give a superior illumination. The first efforts in this direction utilized a reflector which practically doubled the intensity of illumination directly below the lamp, but did not improve the general distribution of light at a distance from the light source. To accomplish the latter, Holophane refractors were developed. These redirect the light, which would normally

go into the upper hemisphere, so that it leaves the refractor at an angle of 10 or 15 degrees below the horizontal. Moreover, the light is entirely redistributed to obtain the most economical and satisfactory results possible.

These refractors have been extensively employed in General Electric street lighting installations both alone and in combination with rippled globes. The use of a refractor obtains directional distribution of the light, while artistic glassware hides the glaring light source.

Holophane refractors in the shape of bowls, bands, and domes are made of two pieces of glass firmly held together in the proper mutual



Fig. 16. Holophane Bowl Refractor

relation. The construction of these three types is in general the same. The inside surface of the inner section and the outside surface of the outer section are both smooth, making the inside and outside surfaces of the assembled unit smooth and easy to clean. The outside surface of the inner section is formed of horizontal prisms which redirect the upward light and bend slightly upward the excess light emitted downward near the vertical, thus materially increasing the light leaving the unit between the angles of 5 and 30 degrees below the horizontal. This obviously extends the radius of effective illumination. The inside surface of the outer section has vertical prisms, which spread the light transversely without noticeably altering the improved distribution produced by the inside section. Glare is also reduced by the outer section. In the dome refractor, however, the inside surface of the outer section is smooth, and diffusion of the light is obtained by the use of rippled enclosing globes, which greatly diminish the glare.

Bowl Refractor

The inside section of the bowl refractor originally had horizontal prisms over its entire surface, but this construction resulted in a comparatively dark spot vertically below the unit. The next design for this section had horizontal prisms on only the upper half of the surface, leaving the lower half clear. This change gave more satisfactory results, but the line of division between the horizontal prisms and the clear glass was conspicuous when the unit was lighted, and the lower half of the refractor did not appear to be lighted at all. The lower half of the inside section was therefore frosted, the unit then presenting a very pleasing appearance. This refractor has been extensively used.



Fig. 17. Holophane Band Refractor

Band Refractor

Designed primarily for use when a totally enclosing unit was not desired, the band refractor represents the next step in the construction of refractors. It permits the natural distribution of light from the bare lamp on the area directly beneath the unit, but conserves the light tending to go into the upper hemisphere by redirecting it at an angle of about 10 degrees below the horizontal.

Dome Refractor



Fig. 18. Holophane Dome Refractor

The dome refractor is the latest development for obtaining symmetrical distribution of light. It is especially designed to be placed inside a rippled globe, which conceals the glaring light source, but permits the desirable distribution of light achieved by these types of refractors. The distribution obtained with this unit is essentially the same as that from the bowl and band refractors, while glare has been minimized by hiding the light source behind artistic glassware. It is the most efficient and convenient form of refractor.

A-SYM-ETRIC Dome Refractor

In certain residential streets, the location of the residences with respect to the street often causes an unnecessary amount of light to be thrown on them. To obviate this condition a new form, known as the A-SYM-ETRIC Dome Refractor, has been evolved. This gives an asymmetrical distribution, sufficient light passing through the refractor to enable the outlines and features of the houses to be readily distinguishable, while the majority of the upward-emitted light in the direction of the residences is refracted to the street below. On the street side the upward light is more completely redirected, giving a fan-like distribution on the street. The distribution up and down and across the street resulting from the use of this refractor is similar to that of the bowl, band, and dome types, but the light which would leave the latter refractors in the direction of the houses has been largely redirected to increase the intensity on the street.

The immense advantage of this refractor over other types designed to obtain asymmetrical distribution of light lies in the comparatively uniform intensity which it produces on the street and sidewalk and the complete absence of light streaks, dark areas, and shadows. Glare resulting from a streaky distribution is completely eliminated in the natural distribution effected by the A-SYM-ETRIC Dome Refractor. The light dispersed in the direction of the houses and lawns, although of much lower intensity than that concentrated on the street, is also uniform. With this refractor there are no shadows or dark lines on the enclosing globe, which is thus revealed in its naturally pleasing form. Moreover, its light-producing efficiency is much greater than that of any other device constructed for this special purpose. Briefly the A-SYM-ETRIC Dome Refractor provides maximum utilization of the available light without glare, at a higher efficiency, and with a better appearance of the unit.

Highway Refractor

A specially constructed refractor, for use on highway installations, throws two concentrated beams up and down the road, the angle of direction between the beams being only slightly less than 180 degrees. This angle is provided so that the units can be mounted on poles at the side of the highway and still adequately light the road surface.

TWO- and FOUR-WAY Refractors

In some residential districts where pendent units are suspended over the center of the street, it has been found convenient to use a special TWO-WAY Refractor, which directs the light in two concentrated beams up and down the thoroughfare. A companion FOUR-WAY Refractor, giving a four-beam distribution, may be used at street intersections in such installations.

Conclusion

Some of the intrinsic qualities that distinguish G-E Glassware are summarized as follows:

The skill exercised by artists and engineers in designing the glassware used with all varieties of G-E illuminating equipment—center span, bracket, ornamental standard, or ornamental bracket—insures perfect harmony between the unit and the fixture on which it is to be mounted. This is a very important consideration, for street lighting units are located where they are continually observed by the public, and any lack of good taste in the design is soon noted and criticized.

Rippled glassware, which lends much charm to the appearance of the globes, canopies, and panels, is distinctly a G-E product. The lively, sparkling effect produced by this construction feature is an advantage that is early recognized wherever this glassware makes its appearance.

The ingredients which constitute G-E Glassware are of the best grade obtainable, and the manufacturing processes by which the raw materials are transformed into globes, canopies, and panels are still the subject of careful and continued study with the object of holding them to the highest possible degree of accuracy.

The perfectly annealed pieces of glass, that leave the factory in cartons bearing the G-E monogram, insure the purchaser against losses due to breakage from any except the most unusual causes. Sudden temperature changes and careless handling do not impose the heavy toll of broken equipment that they do on less carefully tested products.

The expertly designed cartons, in which G-E Glassware is packed for shipment, thoroughly protect it from the dangers of rough treatment in transit and by freight handlers at terminals.

These features explain in part why G-E Glassware is being specified in an ever-increasing amount on new installations of street lighting equipment, as well as replacing other glassware in renewals.

Further information concerning G-E Glassware and recommendations for specific installations will be gladly furnished by the nearest sales office of the Company.



G-E Outer Globes

Nomenclature and Data

TRADE NAME	DESCRIPTION
Clear	Sometimes called crystal
C.R.I.	Crystal rough inside (Sandblasted or acid-roughed)
C.R.O.	Crystal rough outside (Sandblasted or acid-roughed)
Opal	Dense, homogeneous glass with very low transmission
Carrarra	Light density, homogeneous glass with fairly high transmission—good diffusion—shows light source
Marbo	
Alba	
Inlite	
Genco	Very light density, homogeneous glass with high transmission—excellent diffusion—light weight—conceals light source
Monax	
Snow-White	
Alabaster	Cased or plated glass—fairly good diffusion—consists of one casing of clear and one of opal glass—light and medium densities
Polycase	Three-cased glass of opal, plated on inside and outside with clear glass. Particularly adapted for use with 6.6-amp. ornamental luminous arc lamps—strong and does not show pitting
Rippled	Clear or alabaster glass—better diffusion—less glare
Granite Opalescent	Irregular-surfaced glass flashed with opal
Stippled	Rough-surfaced clear glass—provides good diffusion

GLOBE NO.	UNIT USED ON	GLOBE NO.	UNIT USED ON
14	Pendent Luminous Arc (except Form 17)	115-S	Side Panels for Forms 18B and 19B Novalux
	Special Form 1 Novalux	116	Forms 6 and 25A Novalux
37	Form 10 Luminous Arc		(Supersedes 105)
	Forms 4, 9, 12, 16, and 22 Novalux	118	Forms 4, 9, 12, 16, and 22 Ornamental Novalux
39	Form 12, residential-type Ornamental Luminous Arc	120	Form 6 Pendent Novalux
	Forms 8, 12, 13, and 22 Ornamental Novalux	121-S	Side Panels for Form 23A Novalux
85	Form 17 Pendent Luminous Arc	122-C	Canopy Panels for Forms 23B and 24B Novalux and Cleveland Lantern
87	Form 6 Pendent Novalux	122-D	Door Panel for Forms 23B and 24B Novalux and Cleveland Lantern
88	Panels for Form 16 Luminous Arc	122-L	Lower Panels for Form 24B Novalux
90	Panels for Forms 4, 9, 12, 16, and 22 Novalux and Luminous Arc	122-S	Side Panels for Forms 23B and 24B Novalux and Cleveland Lantern
92	Form 13 Novalux	123	Forms 8, 12, and 22 Ornamental Novalux
93	Forms 8, 10, 12, 13, and 22 Novalux	124	Forms 12 and 22 Ornamental Novalux
97	Forms 4, 9, 12, 16, and 22 Novalux	125	Forms 6, 11, and 17 Novalux, Eternalite and Brackets (Supersedes 100)
98	Forms 11 and 17 Novalux, Eternalite and Brackets	126	Form 21 Luminous Arc and Forms 4, 9, 12, 16, and 22 Novalux
101	Novalux Projector Unit, Form 1	127	Forms 8, 10, 12, 13, and 22 Ornamental Novalux
103	Forms 8, 12, and 22 Novalux	128	Forms 8, 10, 12, 13, and 22 Novalux
104	Forms 12 and 22 Novalux	134	Luminous Arcs—Used without the upper globe seat extension—similar to No. 118
107	Forms 4, 9, 12, 16, and 22 Ornamental Novalux	135	Form 30 Novalux—Has 7-inch bottom fitter—Similar to No. 107
108	Forms 1 and 25B Novalux and Pendent Luminous Arc (except Form 17)	136	Panels for Forms 4, 9, 16, 18, and 22 Novalux and Luminous Arc
109	Forms 8, 10, 12, 13, and 22 Ornamental Novalux	137	Similar to No. 37 except is rippled—Form 10 Luminous Arcs only
114-C	Canopy Panels for Forms 18A and 19A Novalux	138	Rippled globe for St. Louis
114-L	Lower Panel for Form 19A Novalux	139	Diffusing globe for St. Louis
114-S	Side Panels for Forms 18A and 19A Novalux	141	Globe for Gas Filling Stations
115-C	Canopy Panels for Forms 18B and 19B Novalux	143	Rippled Globe Replacing No. 125
115-L	Lower Panel for Form 19B Novalux		

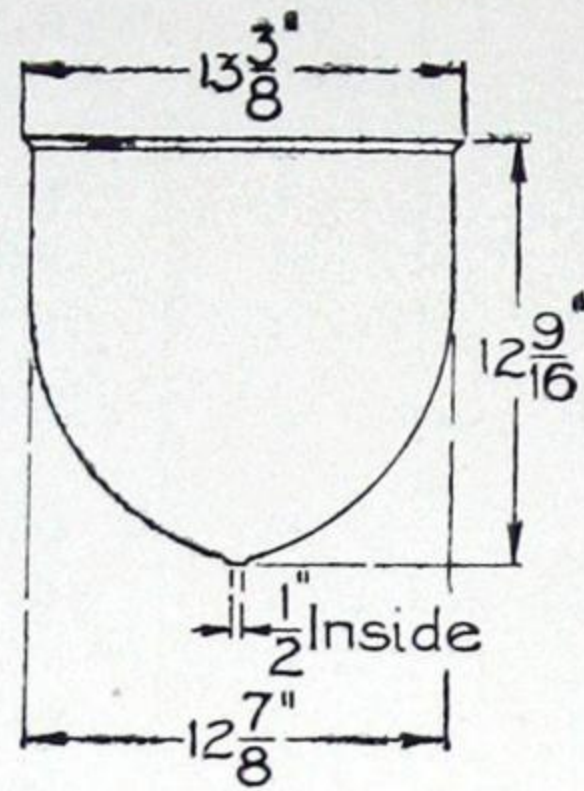
Packing Data

GLOBE NO.	CONTAINER	INSIDE DIMENSIONS OF CONTAINER IN INCHES	OUTSIDE DIMENSIONS OF CONTAINER IN INCHES	NUMBER IN CONT'R	TOTAL WEIGHT IN LB.
14	Carton	15 by 15 by 14 $\frac{3}{4}$	15 $\frac{5}{8}$ by 15 $\frac{5}{8}$ by 15 $\frac{3}{4}$	1	10
37	Carton	19 by 19 by 17	19 $\frac{1}{2}$ by 19 $\frac{1}{2}$ by 18	1	17
39	Carton	15 $\frac{1}{2}$ by 15 $\frac{1}{2}$ by 14	16 by 16 by 15	1	11
85	Carton	18 by 18 by 18 $\frac{1}{2}$	18 $\frac{5}{8}$ by 18 $\frac{5}{8}$ by 19 $\frac{1}{2}$	1	12
87	Carton	14 $\frac{1}{2}$ by 14 $\frac{1}{2}$ by 14	15 by 15 by 15	1	9
90P	Barrel	.. ..	23 by 23 by 30	32	90
92	Carton	16 $\frac{1}{2}$ by 16 $\frac{1}{2}$ by 18 $\frac{3}{4}$	17 by 17 by 19 $\frac{3}{4}$	1	15
93	Carton	16 $\frac{1}{2}$ by 16 $\frac{1}{2}$ by 18 $\frac{3}{4}$	17 by 17 by 19 $\frac{3}{4}$	1	15
97	Carton	20 by 20 by 21 $\frac{3}{4}$	20 $\frac{1}{2}$ by 20 $\frac{1}{2}$ by 22 $\frac{3}{4}$	1	26
98	Barrel	.. ..	23 by 23 by 30	6	70
101	Barrel	.. ..	23 by 23 by 30	1	55
103	Carton	18 by 18 by 19 $\frac{7}{8}$	18 $\frac{1}{2}$ by 18 $\frac{1}{2}$ by 20 $\frac{7}{8}$	1	18
104	Carton	20 by 20 by 22 $\frac{1}{2}$	20 $\frac{1}{2}$ by 20 $\frac{1}{2}$ by 23 $\frac{1}{2}$	1	23
107	Carton	19 by 19 by 17	19 $\frac{1}{2}$ by 19 $\frac{1}{2}$ by 18	1	17
108	Carton	16 by 16 by 26 $\frac{7}{8}$	16 $\frac{1}{2}$ by 16 $\frac{1}{2}$ by 27 $\frac{7}{8}$	3	29
109	Carton	15 $\frac{1}{2}$ by 15 $\frac{1}{2}$ by 14	16 by 16 by 15	1	11
114SP	Case	.. ..	.. ..	64	100
114CP	Case	.. ..	.. ..	128	87
115SP	Tube	.. ..	6 by 3 $\frac{1}{4}$ by 15	8	...
115SP	Case	17 by 17 by 15	20 $\frac{1}{2}$ by 18 by 15 $\frac{3}{4}$	64	110
115CP	Tube	.. ..	5 $\frac{5}{8}$ by 3 $\frac{1}{4}$ by 9	8	...
115CP	Case	21 by 18 by 14 $\frac{1}{2}$	23 $\frac{1}{2}$ by 19 by 15 $\frac{1}{4}$	128	95
116	Carton	15 by 15 by 25 $\frac{3}{8}$	15 $\frac{1}{2}$ by 15 $\frac{1}{2}$ by 26 $\frac{3}{8}$	3	23
118	Carton	20 by 20 by 21 $\frac{3}{4}$	20 $\frac{1}{2}$ by 20 $\frac{1}{2}$ by 22 $\frac{3}{4}$	1	26
120	Carton	14 $\frac{1}{2}$ by 14 $\frac{1}{2}$ by 14	15 by 15 by 15	1	9
121P					
122P					
123	Carton	18 by 18 by 19 $\frac{7}{8}$	18 $\frac{1}{2}$ by 18 $\frac{1}{2}$ by 20 $\frac{7}{8}$	1	18
124	Carton	20 by 20 by 22 $\frac{1}{2}$	20 $\frac{1}{2}$ by 20 $\frac{1}{2}$ by 23 $\frac{1}{2}$	1	23
125	Carton	20 $\frac{3}{4}$ by 20 $\frac{3}{4}$ by 17 $\frac{1}{4}$	21 $\frac{1}{4}$ by 21 $\frac{1}{4}$ by 18 $\frac{1}{4}$	8	31
126	Barrel	.. ..	26 by 26 by 30	1	105
127	Carton	18 by 18 by 20 $\frac{1}{8}$	18 $\frac{1}{2}$ by 18 $\frac{1}{2}$ by 21 $\frac{1}{8}$	1	20
128	Carton	16 $\frac{1}{2}$ by 16 $\frac{1}{2}$ by 18 $\frac{3}{4}$	17 by 17 by 19 $\frac{3}{4}$	1	17
130	Carton	.. ..	.. ..	1	..
134	Carton	20 by 20 by 21 $\frac{3}{4}$	20 $\frac{1}{2}$ by 20 $\frac{1}{2}$ by 22 $\frac{3}{4}$	1	26
135	Carton	.. ..	18 $\frac{1}{2}$ by 18 $\frac{1}{2}$ by 19	1	17
136P	Barrel	.. ..	23 by 23 by 30	32	90
137	Carton	19 by 19 by 17	19 $\frac{1}{2}$ by 19 $\frac{1}{2}$ by 18	1	17
138	Carton	17 by 17 by 21 $\frac{3}{4}$	17 $\frac{1}{2}$ by 17 $\frac{1}{2}$ by 22 $\frac{3}{4}$	1	20
139	Carton	17 by 17 by 21 $\frac{3}{4}$	17 $\frac{1}{2}$ by 17 $\frac{1}{2}$ by 22 $\frac{3}{4}$	1	20
141	Carton	12 by 12 by 12	12 $\frac{1}{2}$ by 12 $\frac{1}{2}$ by 13	1	6 $\frac{1}{2}$
143	Carton	11 $\frac{1}{2}$ by 11 $\frac{1}{2}$ by 14	12 by 12 by 15	1	7
1037	Carton	15 by 15 by 28	15 $\frac{1}{2}$ by 15 $\frac{1}{2}$ by 29	4	22
1039	Carton	15 by 15 by 28	15 $\frac{1}{2}$ by 15 $\frac{1}{2}$ by 29	6	25
1092	Barrel	.. ..	24 by 24 by 30	6	60
1097	Carton	15 by 15 by 28	15 $\frac{1}{2}$ by 15 $\frac{1}{2}$ by 29	4	22
1103	Carton	18 by 18 by 17 $\frac{3}{4}$	18 $\frac{1}{2}$ by 18 $\frac{1}{2}$ by 18 $\frac{3}{4}$	3	25
1104	Carton	20 by 20 by 20 $\frac{3}{8}$	20 $\frac{1}{2}$ by 20 $\frac{1}{2}$ by 21 $\frac{3}{8}$	3	30
1107	Carton	14 by 14 by 24 $\frac{1}{8}$	14 $\frac{1}{2}$ by 14 $\frac{1}{2}$ by 25 $\frac{1}{8}$	6	27
1109	Carton	12 $\frac{1}{2}$ by 12 $\frac{1}{2}$ by 23 $\frac{1}{8}$	13 by 13 by 24 $\frac{1}{8}$	6	21
1118	Carton	26 $\frac{1}{2}$ by 13 $\frac{3}{4}$ by 21 $\frac{1}{4}$	27 by 14 $\frac{1}{2}$ by 22 $\frac{1}{4}$	4	25
1123	Carton	18 by 18 by 17 $\frac{3}{4}$	18 $\frac{1}{2}$ by 18 $\frac{1}{2}$ by 18 $\frac{3}{4}$	3	25
1124	Carton	20 by 20 by 20 $\frac{3}{8}$	20 $\frac{1}{2}$ by 20 $\frac{1}{2}$ by 21 $\frac{3}{8}$	3	30
1126	Carton	14 $\frac{1}{2}$ by 14 $\frac{1}{2}$ by 25	15 by 15 by 26	2	16
1127	Carton	24 $\frac{1}{2}$ by 12 $\frac{3}{4}$ by 19 $\frac{3}{4}$	25 by 13 $\frac{1}{4}$ by 20 $\frac{3}{4}$	4	20
1128	Carton	20 $\frac{3}{4}$ by 10 $\frac{7}{8}$ by 17 $\frac{3}{8}$	21 $\frac{1}{4}$ by 11 $\frac{3}{8}$ by 18 $\frac{3}{8}$	4	15
1138	Carton	13 by 13 by 19 $\frac{3}{4}$	13 $\frac{1}{2}$ by 13 $\frac{1}{2}$ by 20 $\frac{3}{4}$	6	18 $\frac{1}{2}$
1139	Carton	13 by 13 by 19 $\frac{3}{4}$	13 $\frac{1}{2}$ by 13 $\frac{1}{2}$ by 20 $\frac{3}{4}$	6	18 $\frac{1}{2}$

P = Panel; SP = Side Panel; CP = Canopy Panel

G-E Outer Globes

Dimensions



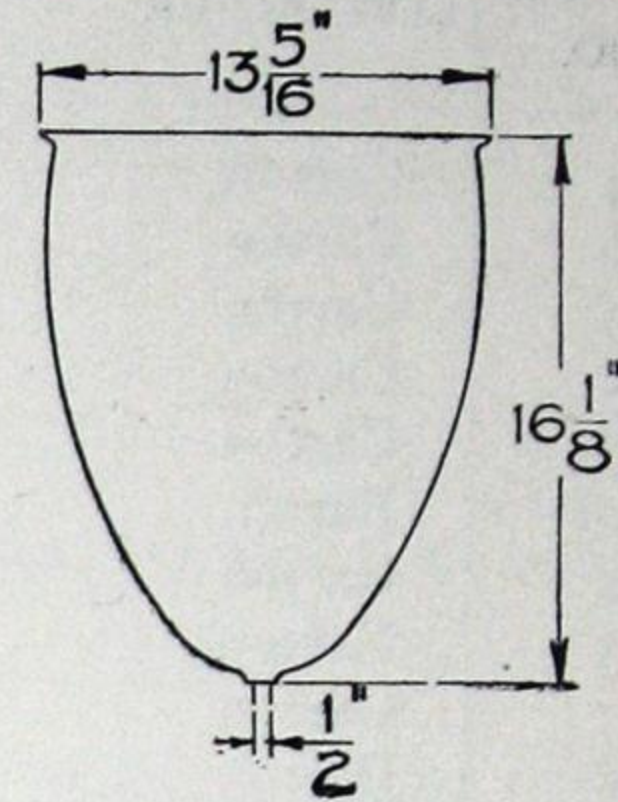
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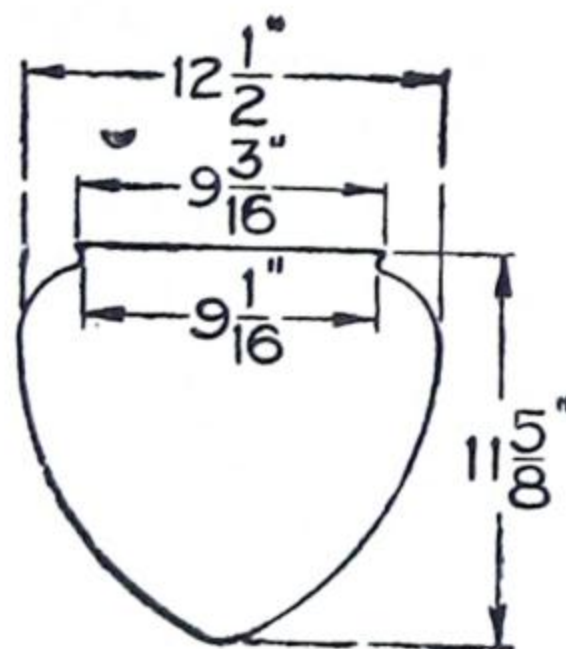
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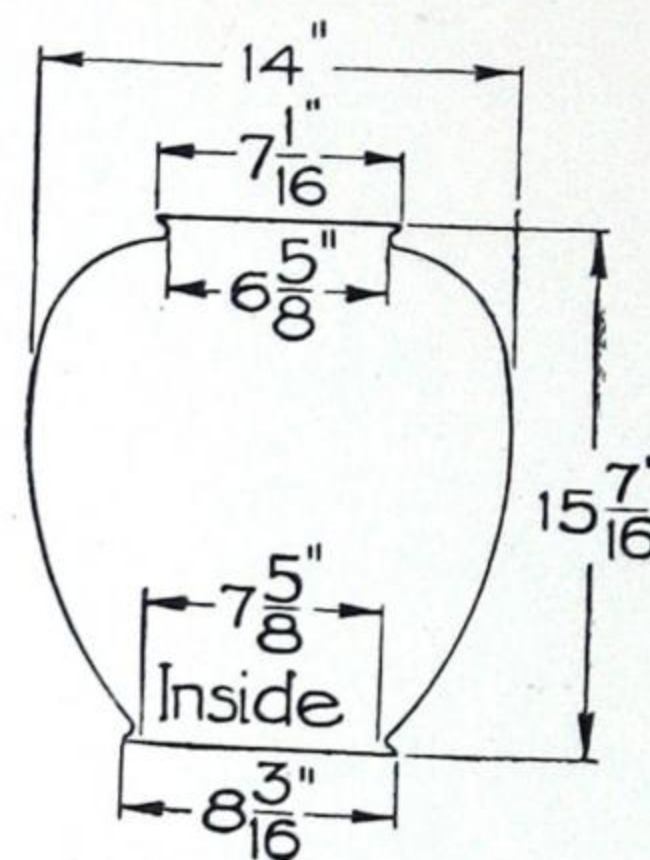


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No. 92

Design Patent 50192



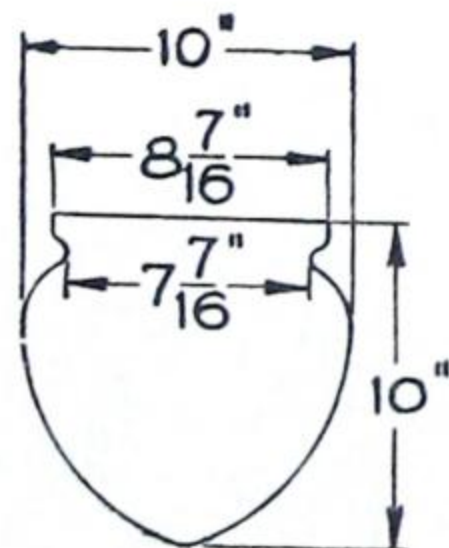
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Design Patent 50192

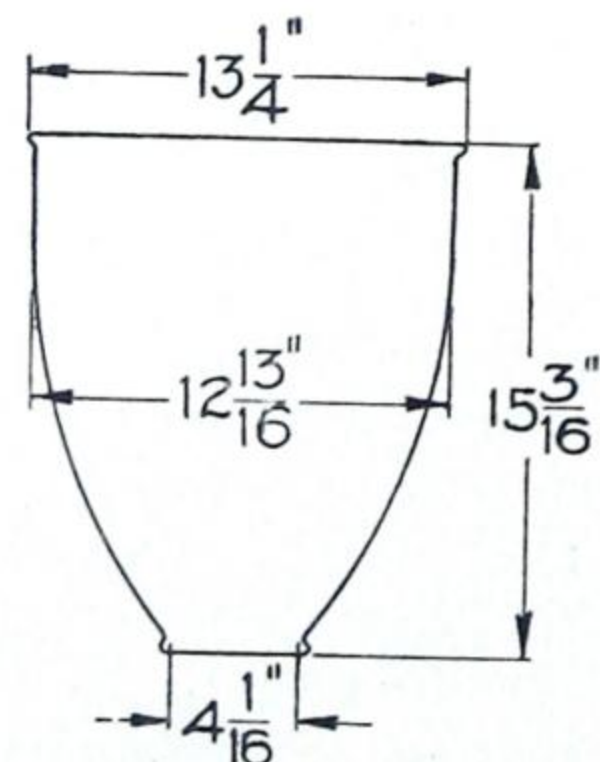
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No. 97

Design Patent 50192



No. 98



No. 101

See Page 20

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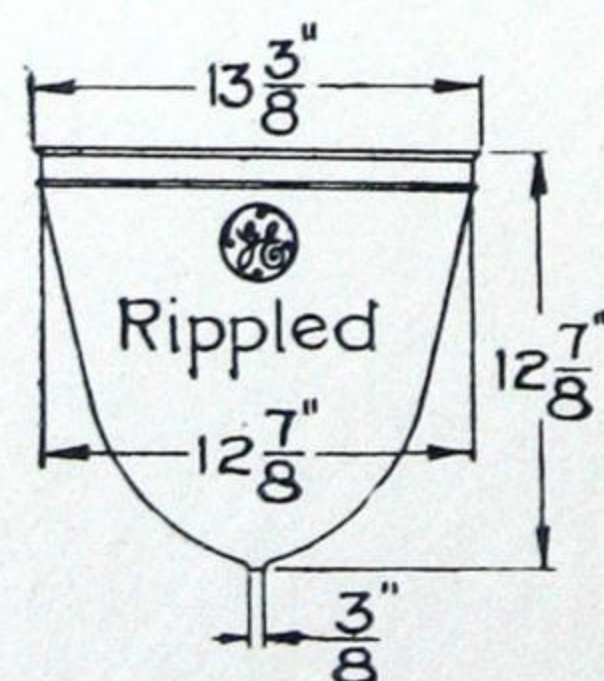
Design Patent 57462

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No. 104

Design Patent 57462

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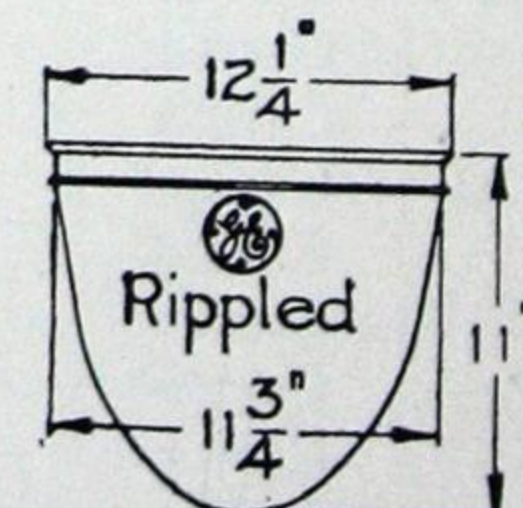


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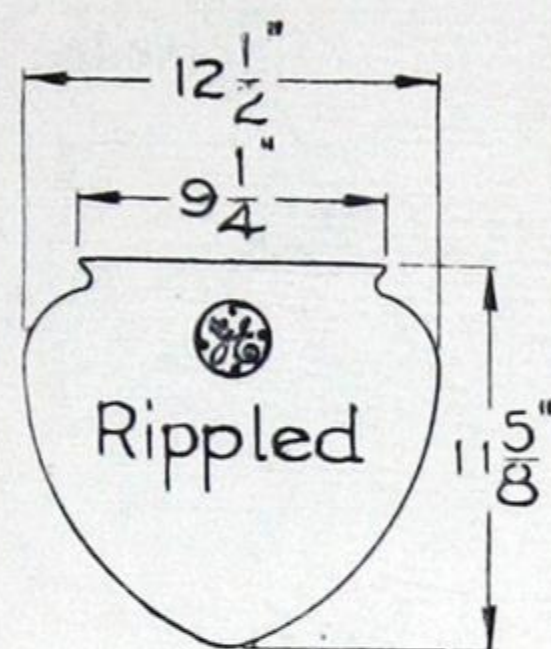


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G-E Outer Globes

Dimensions

See Page 21



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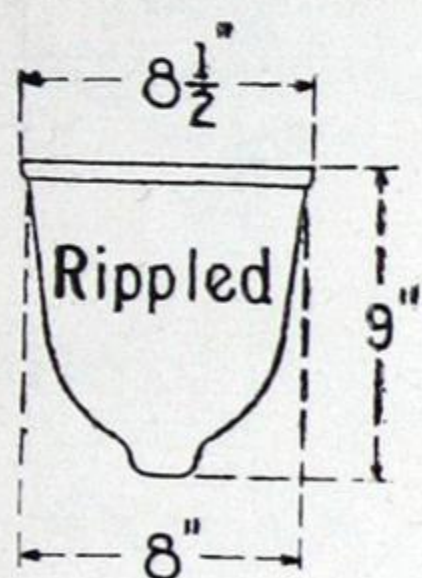
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No. 120

No. 123
Design Patent 57462

No. 124



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See Page 21

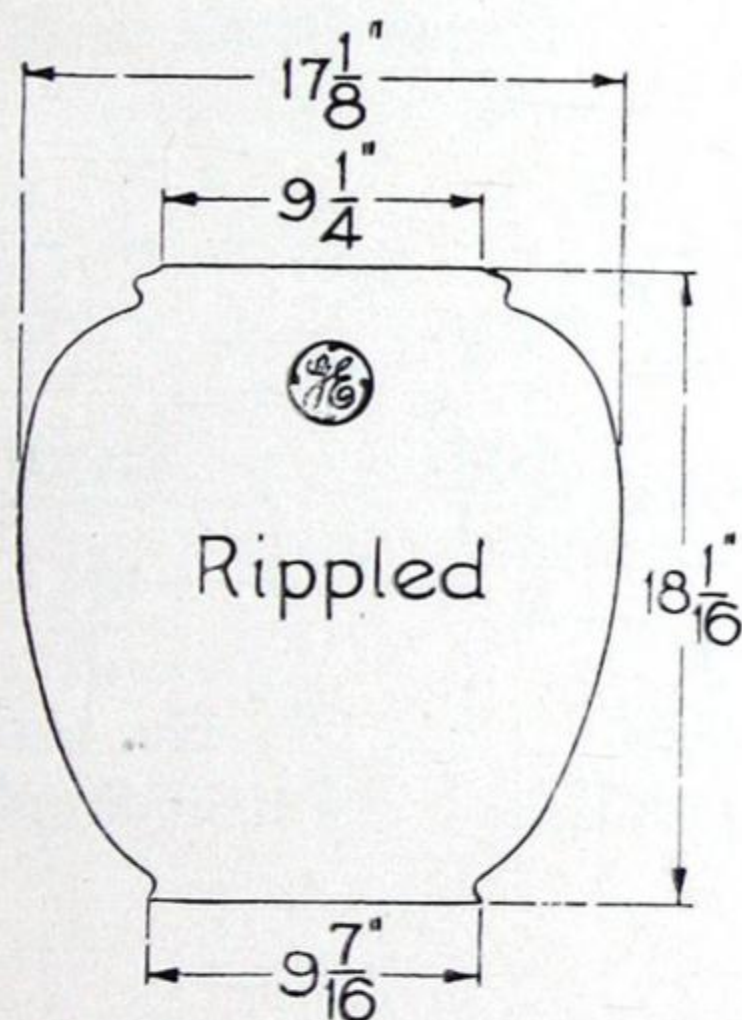
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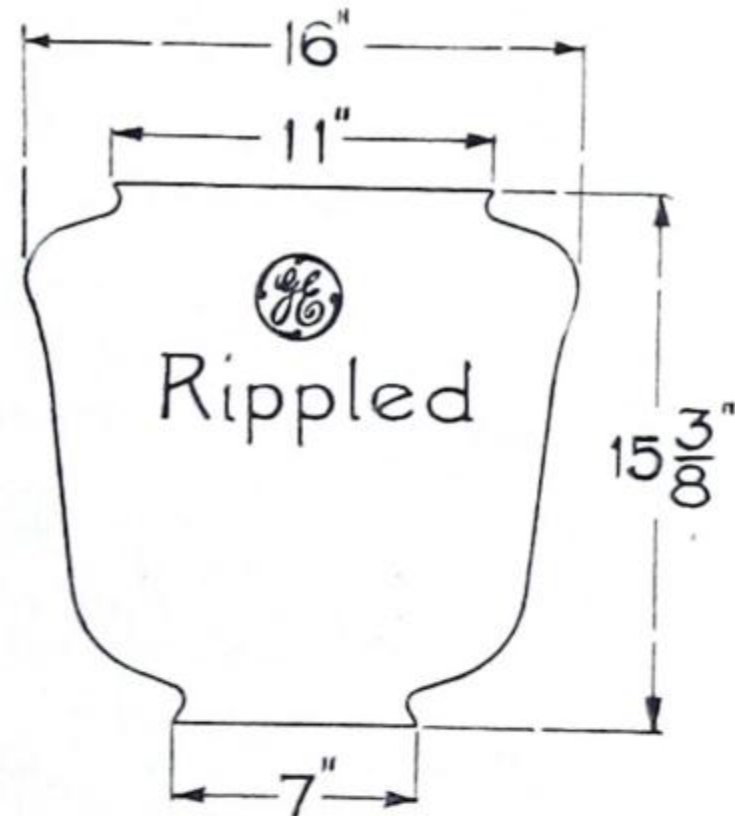
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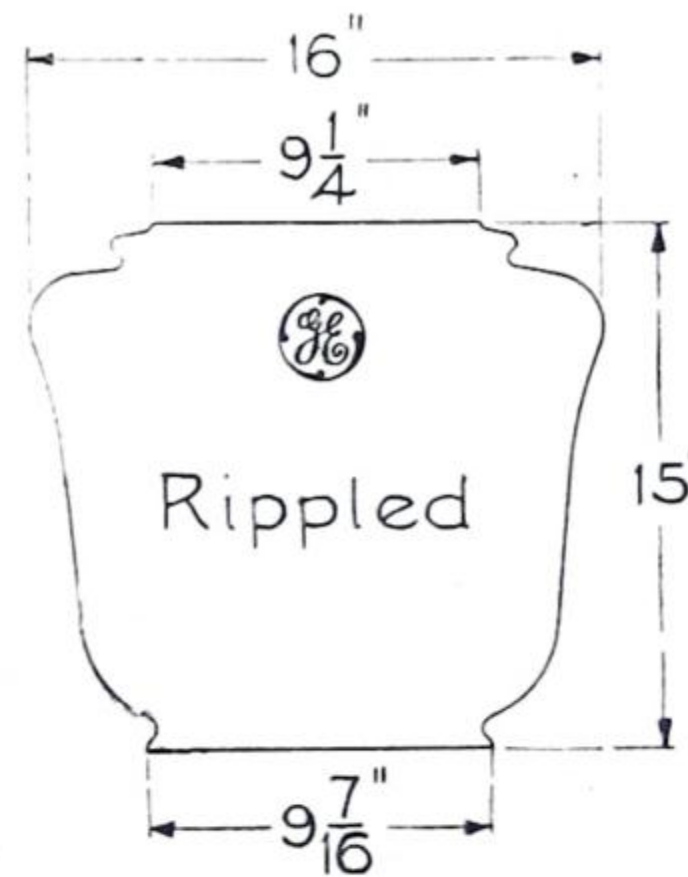
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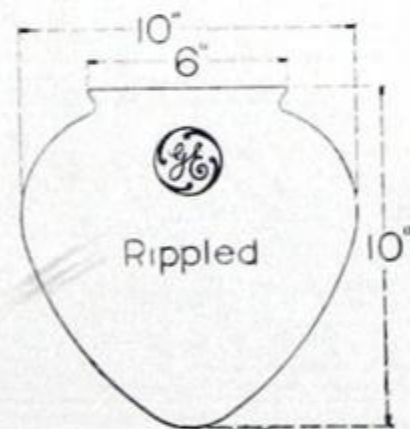


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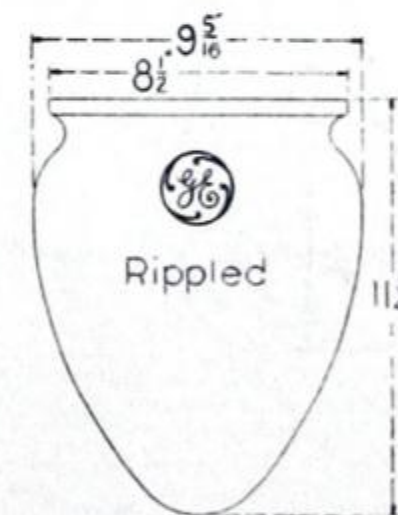
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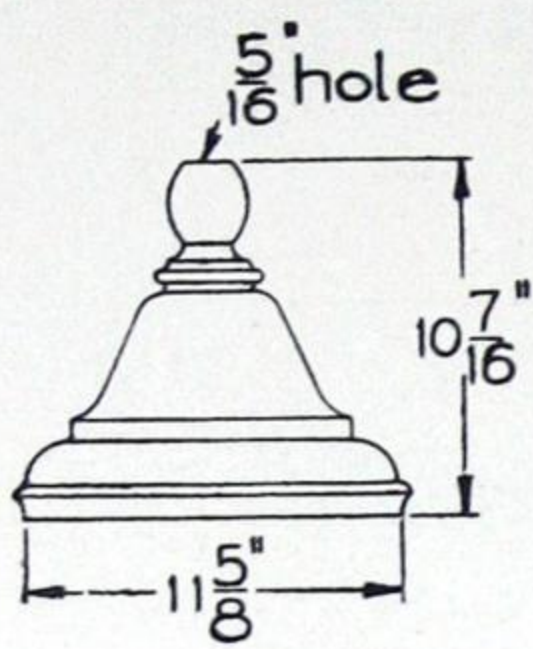
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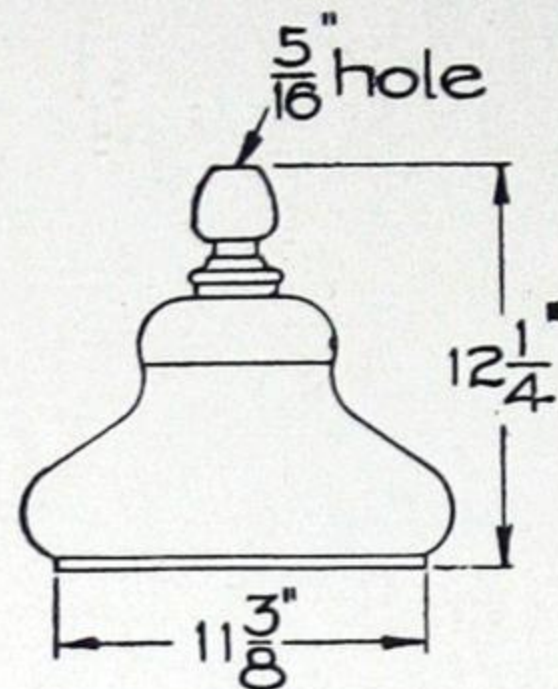
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G-E Globes and Canopies

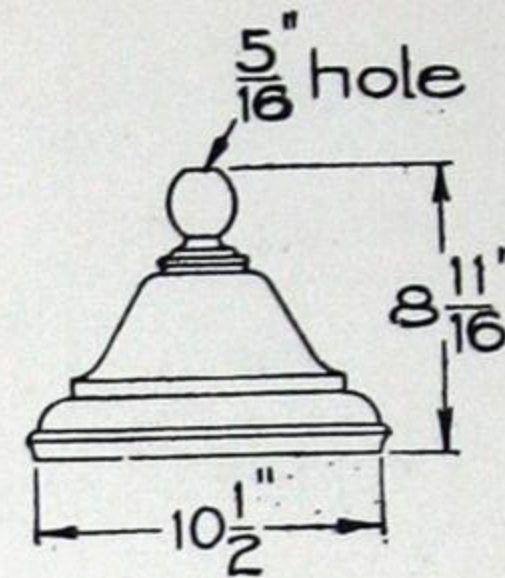
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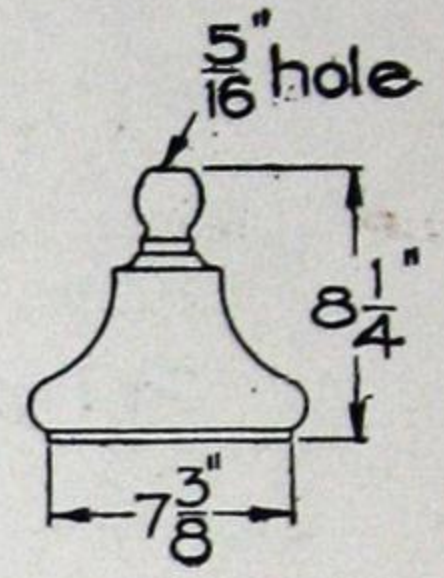
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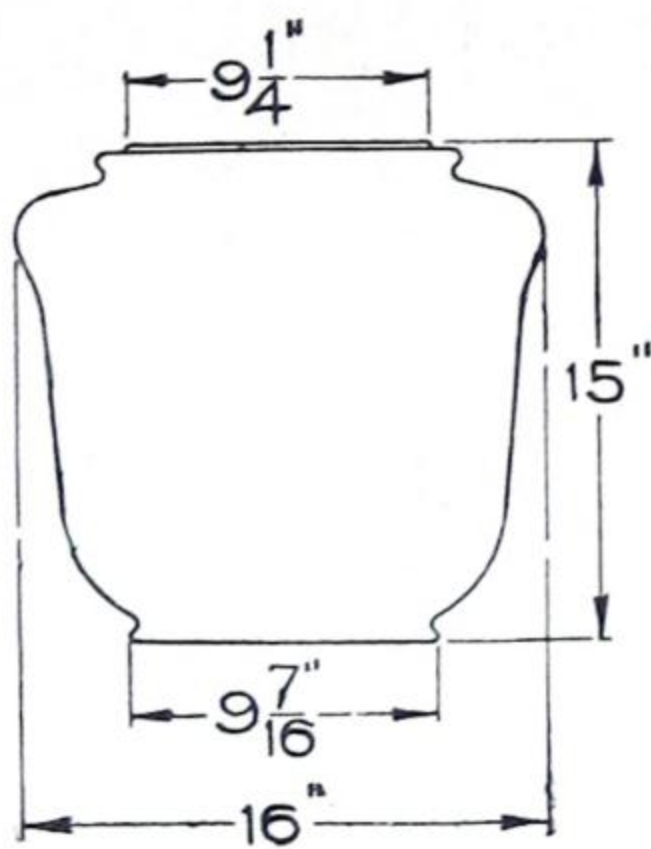
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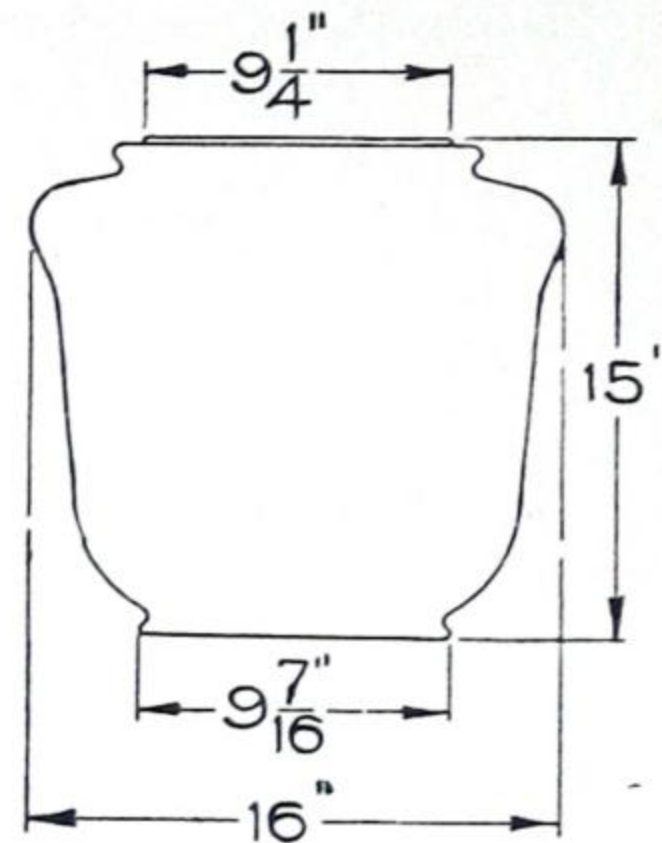
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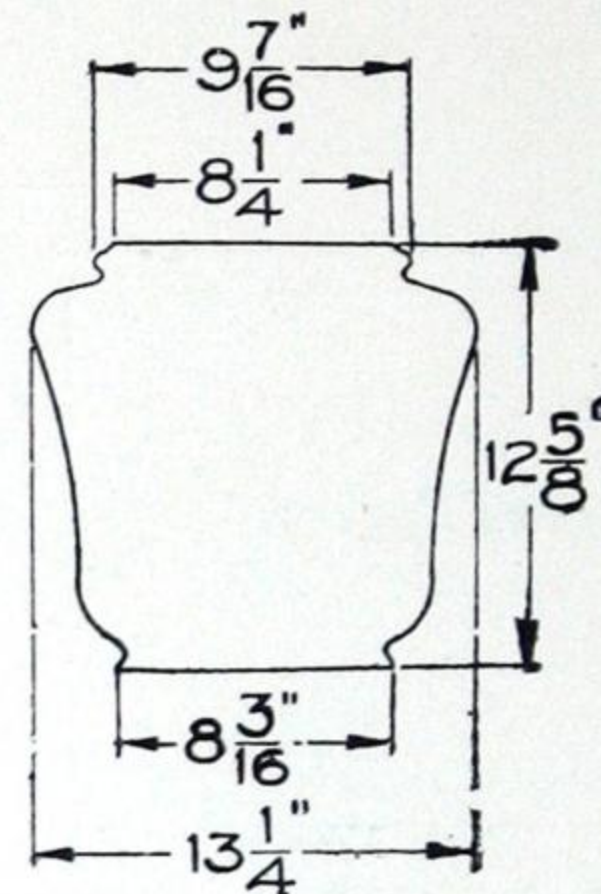
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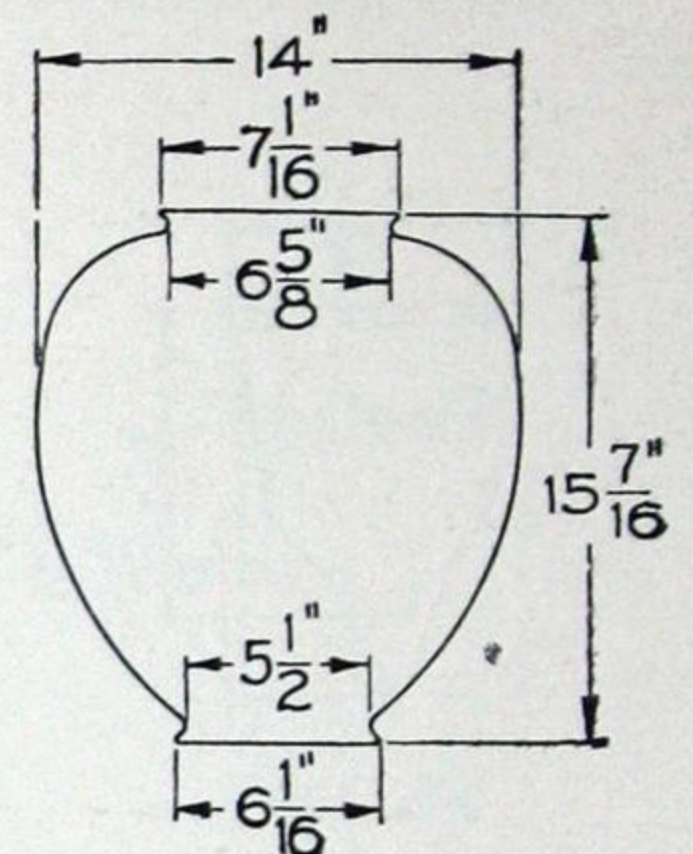
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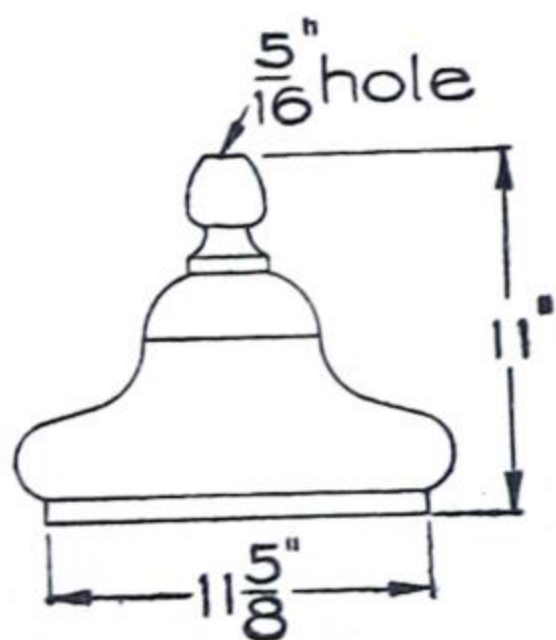
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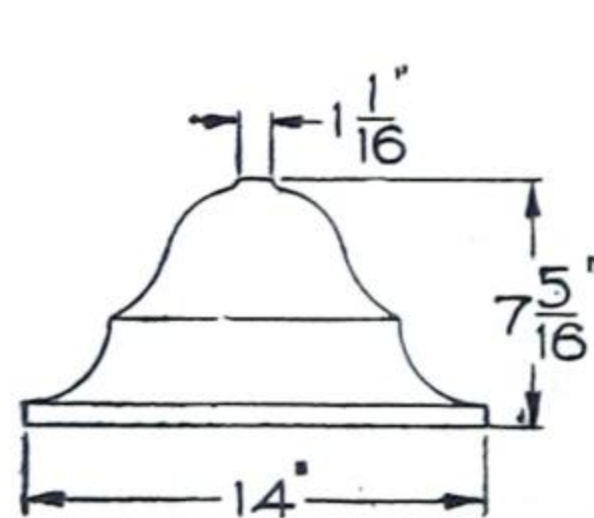
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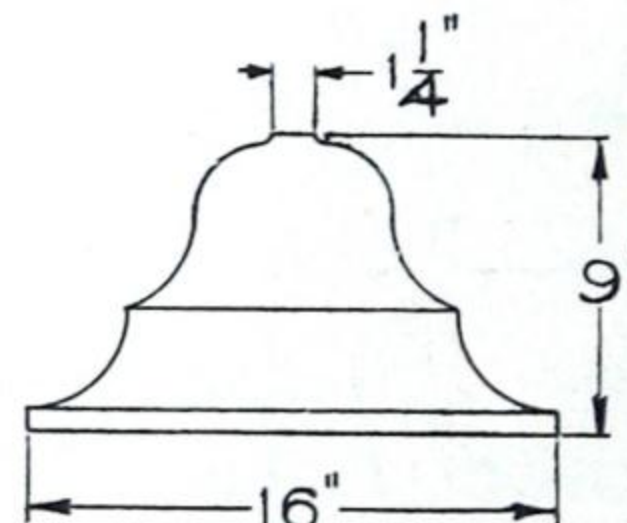
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Design Patent 50192



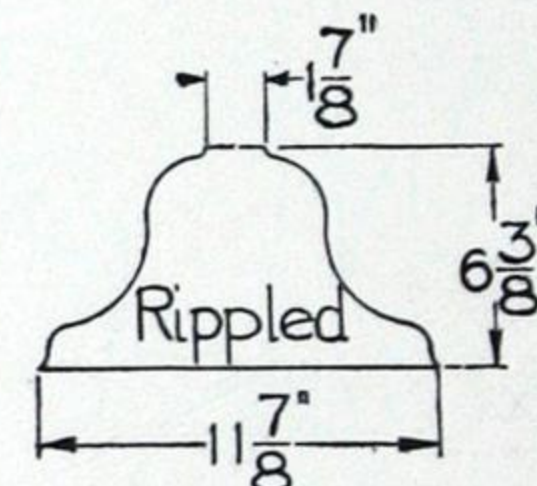
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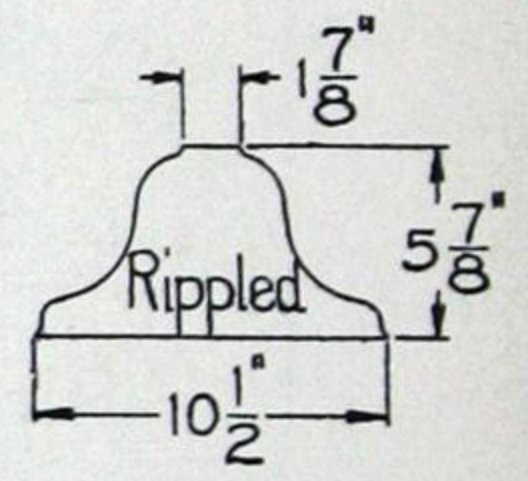
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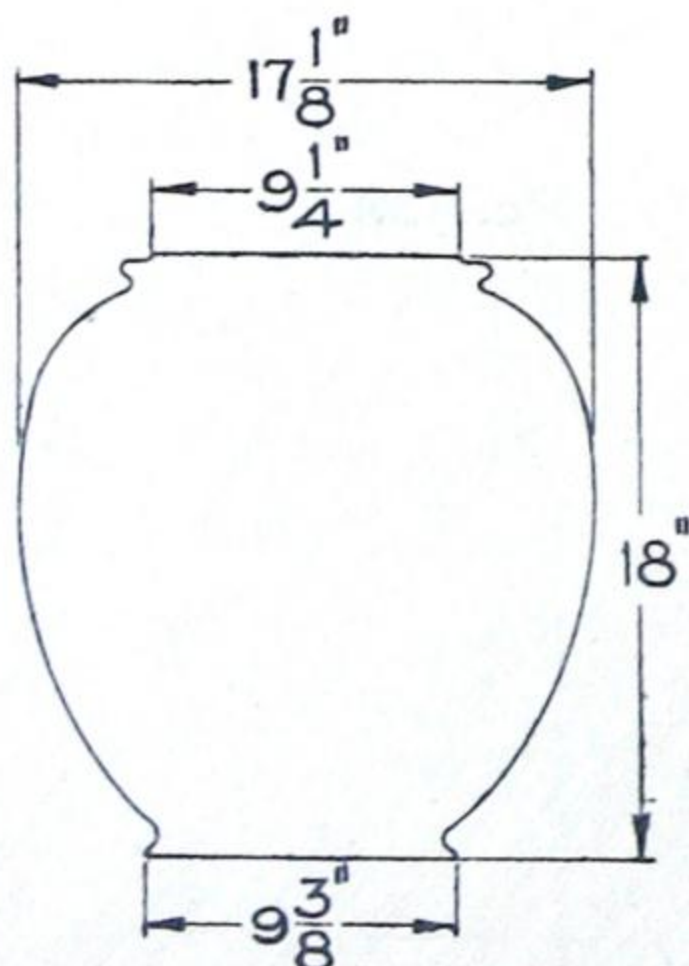
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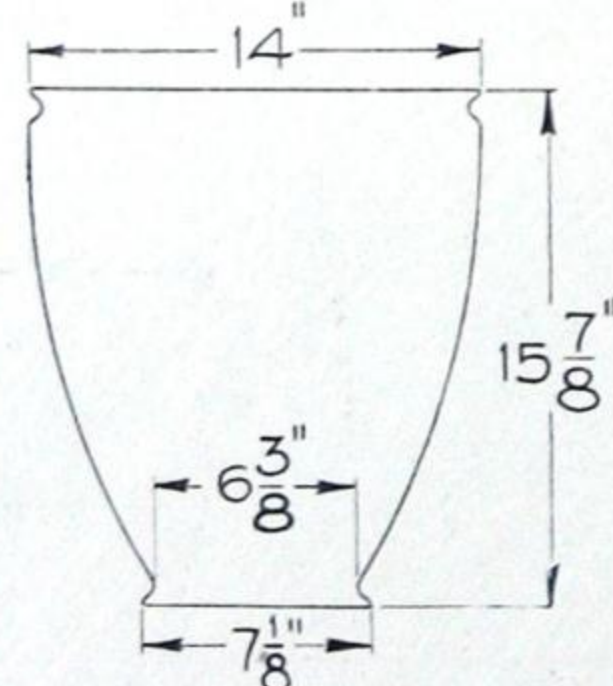
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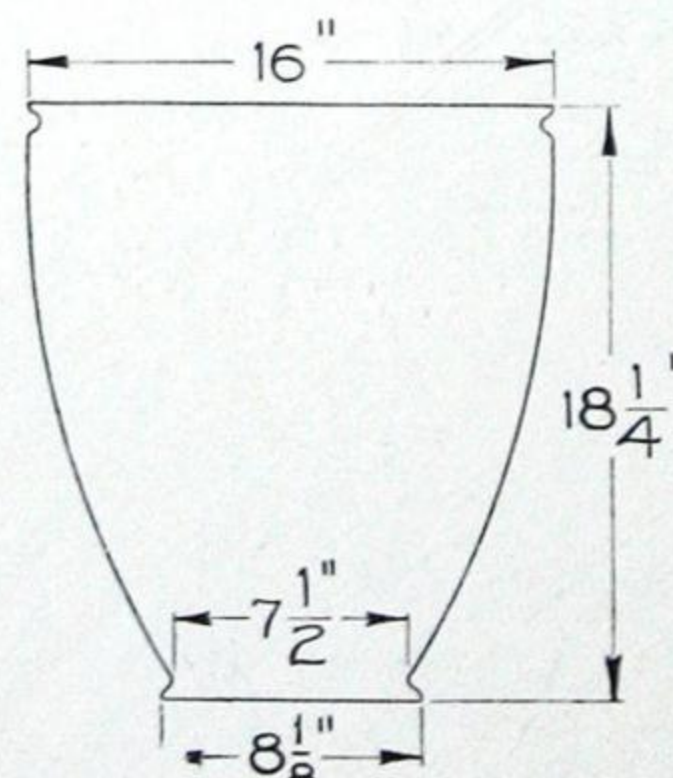
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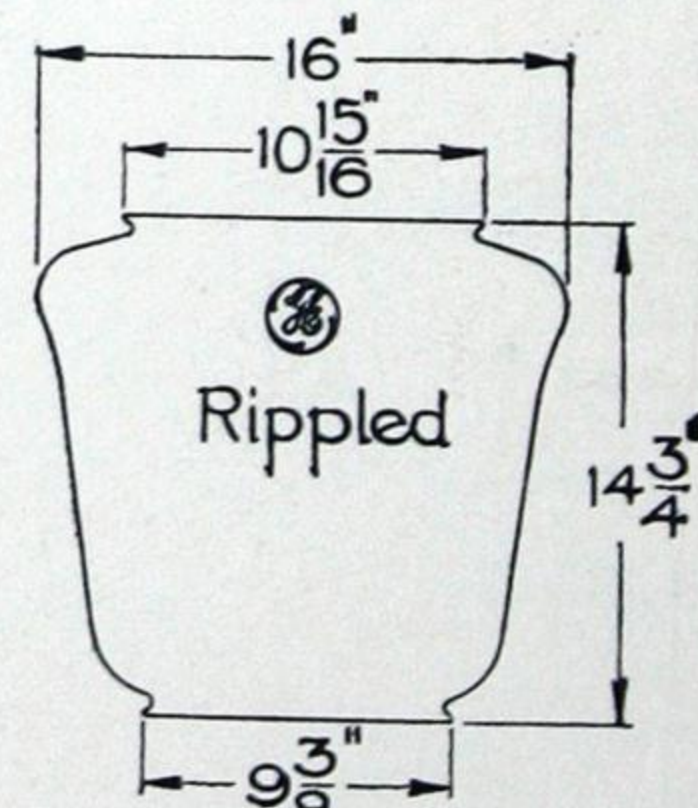
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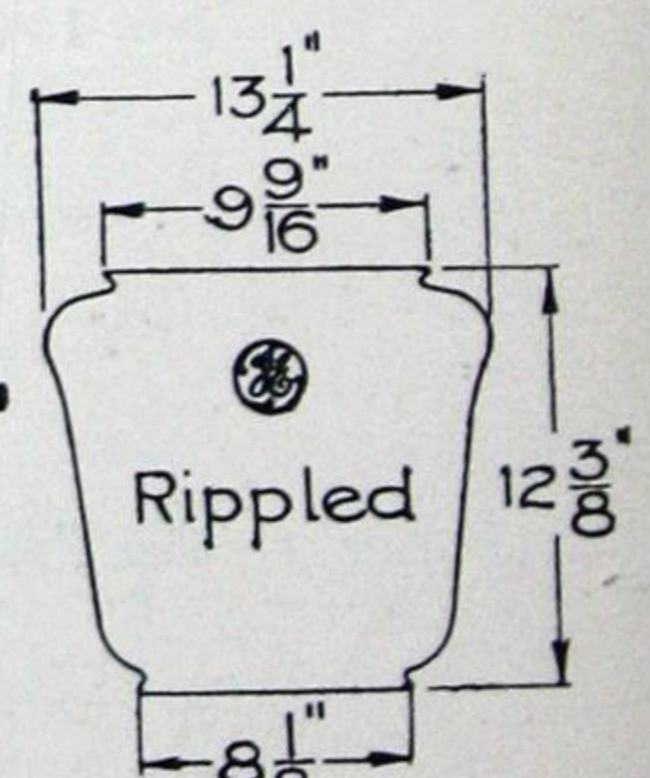
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Design Patent 57462



No. 104
Design Patent 57462



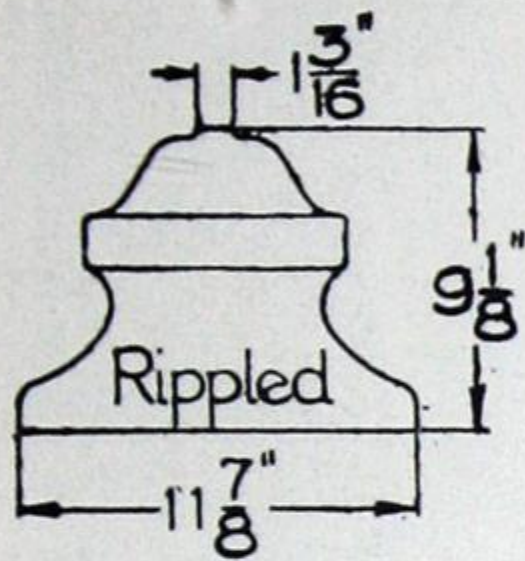
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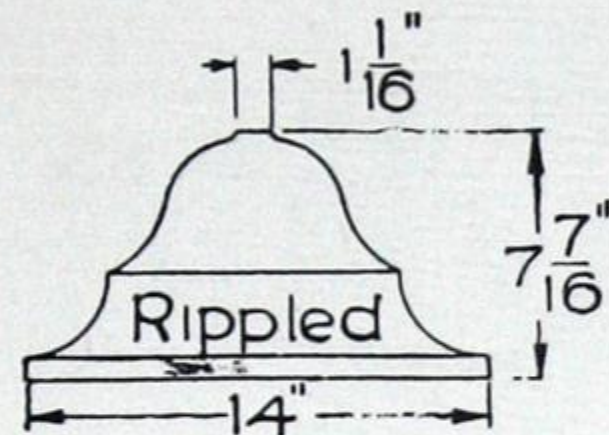
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G-E Outer Globes and Canopies

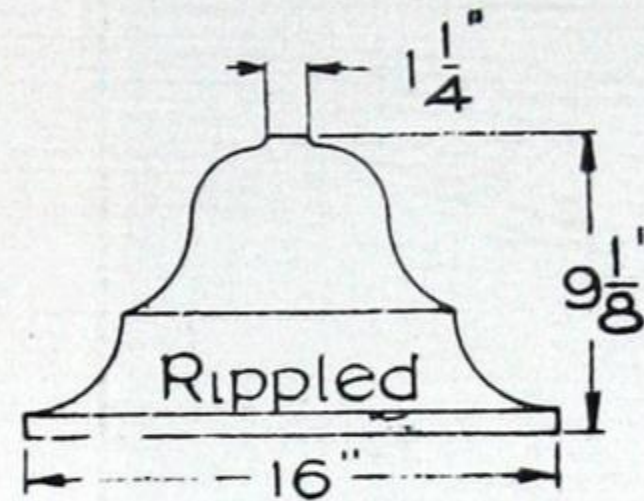
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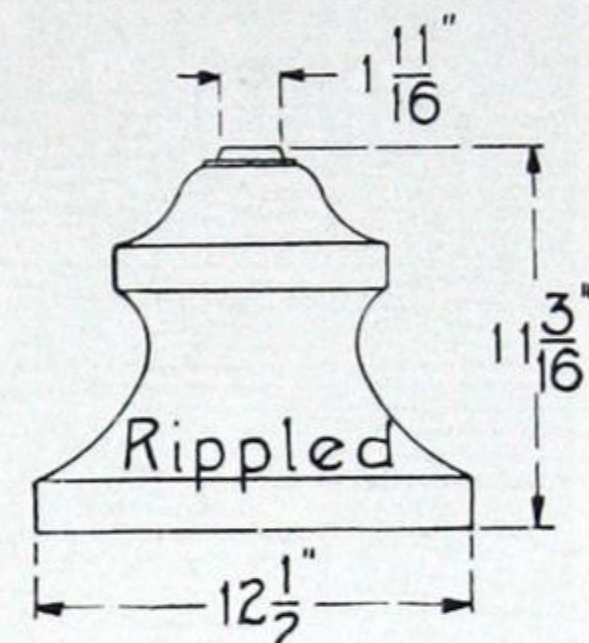
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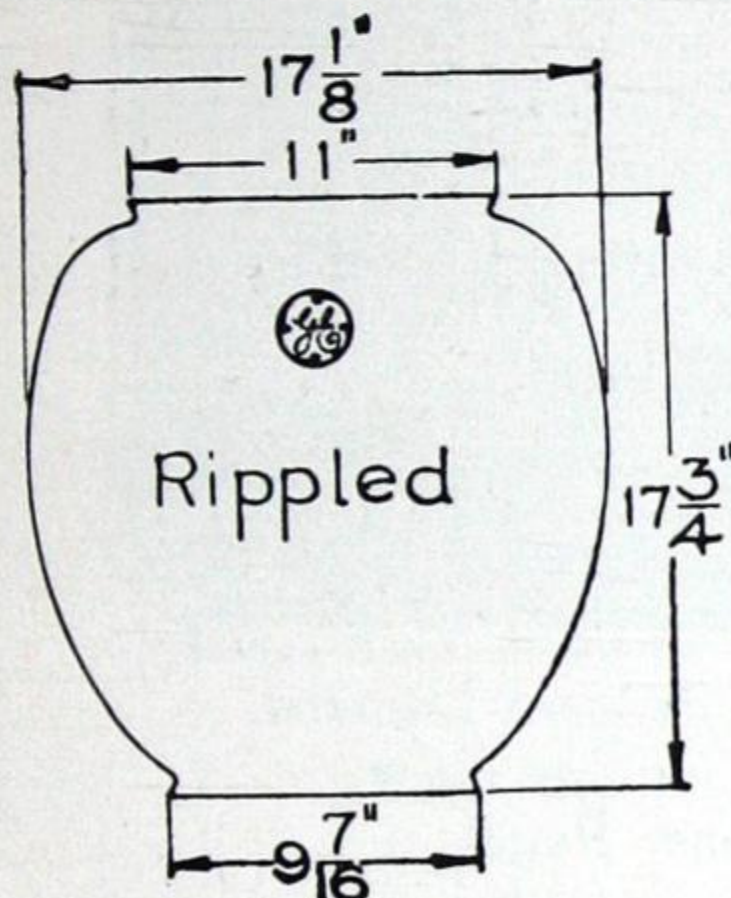
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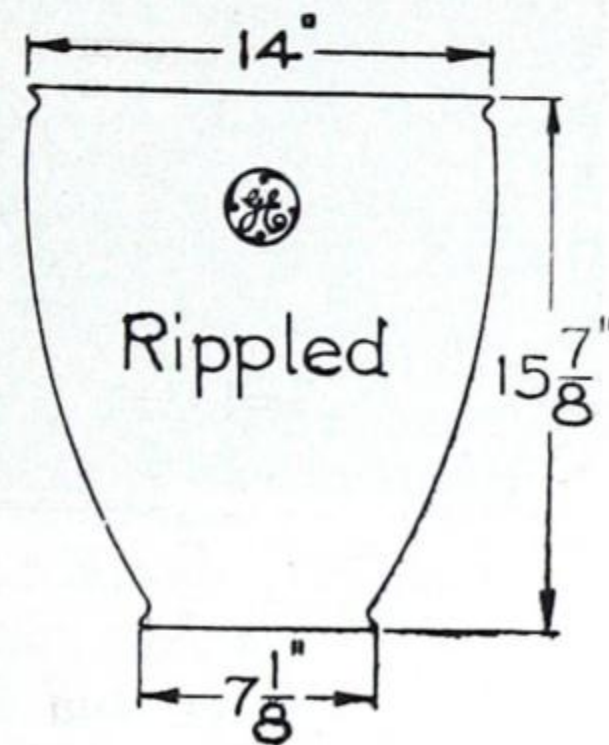
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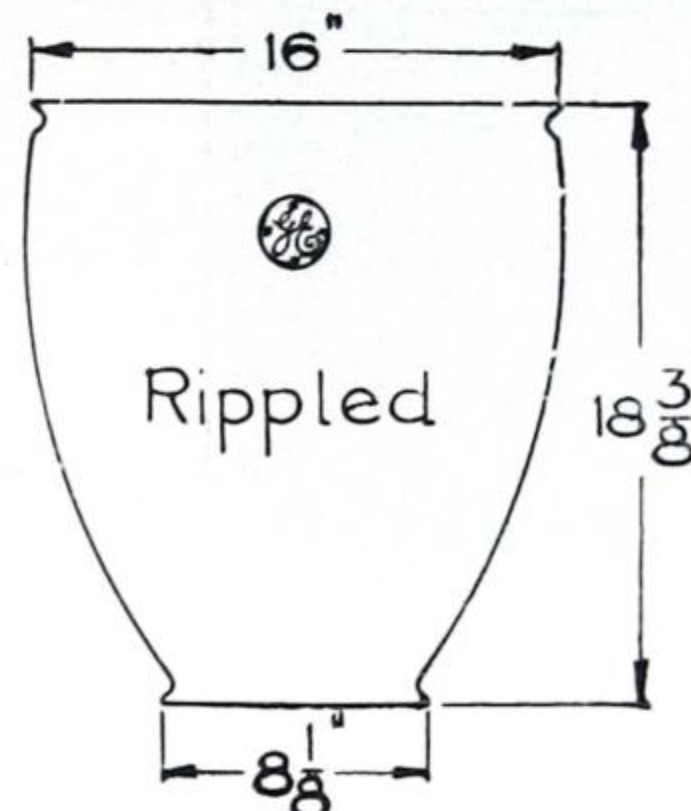
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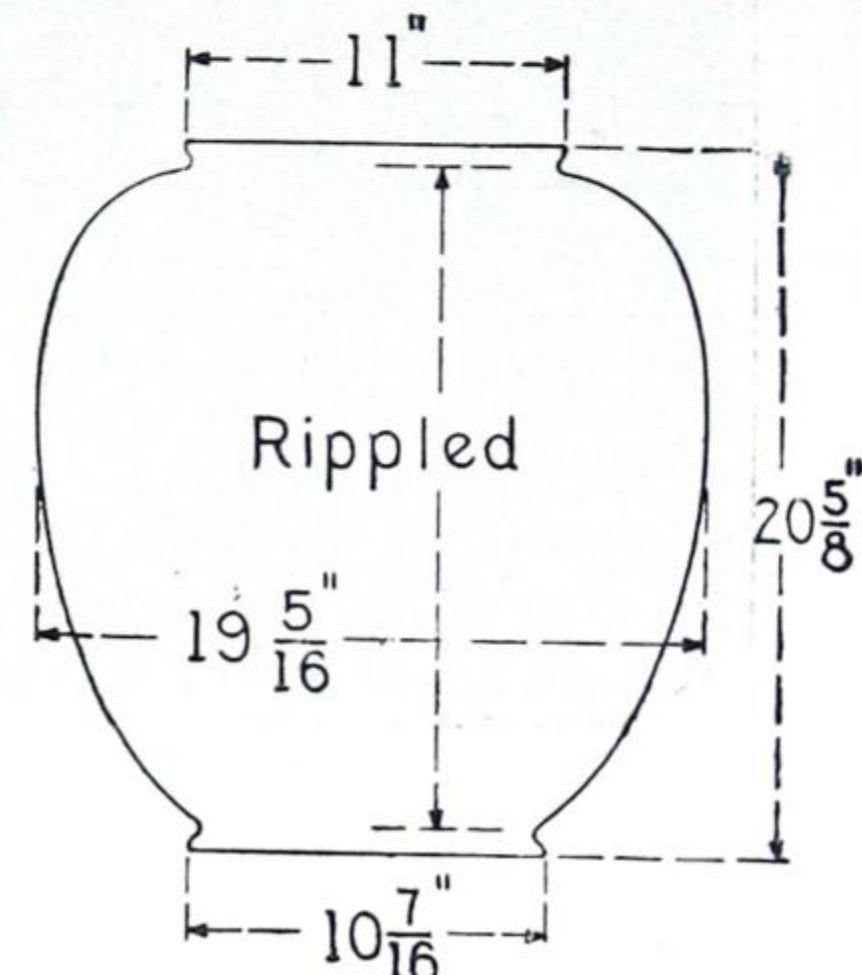
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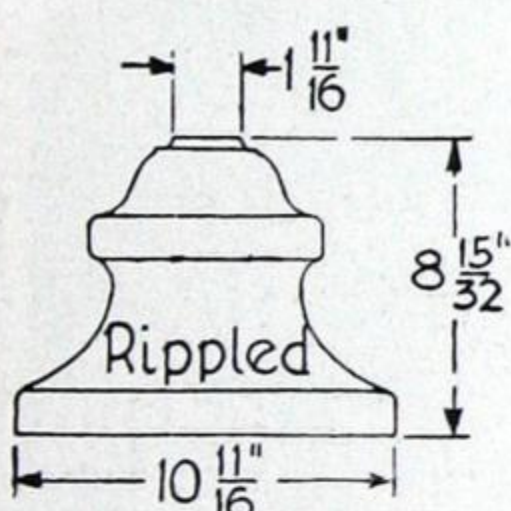
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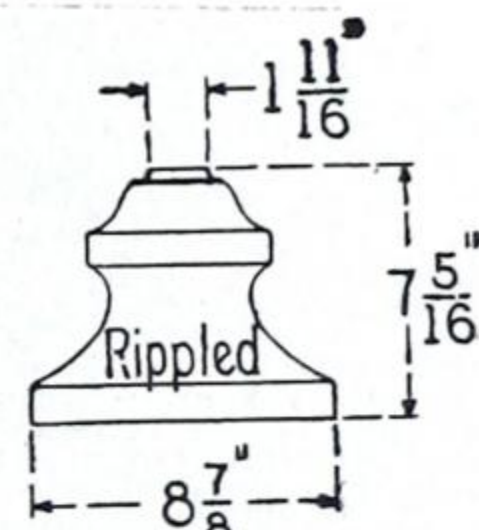
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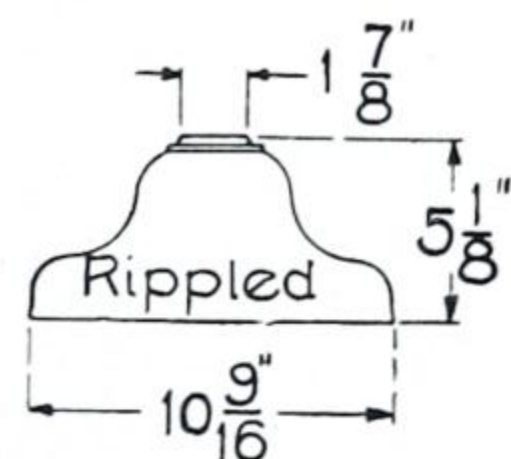
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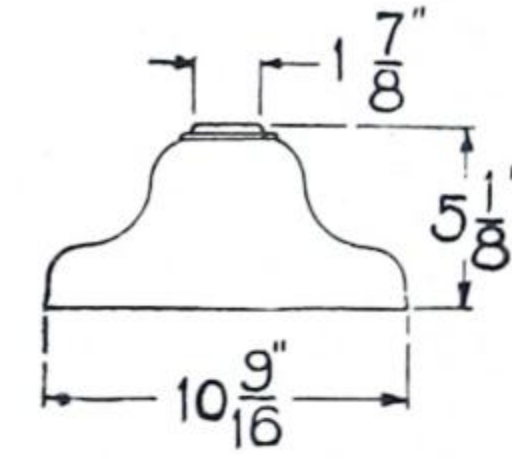
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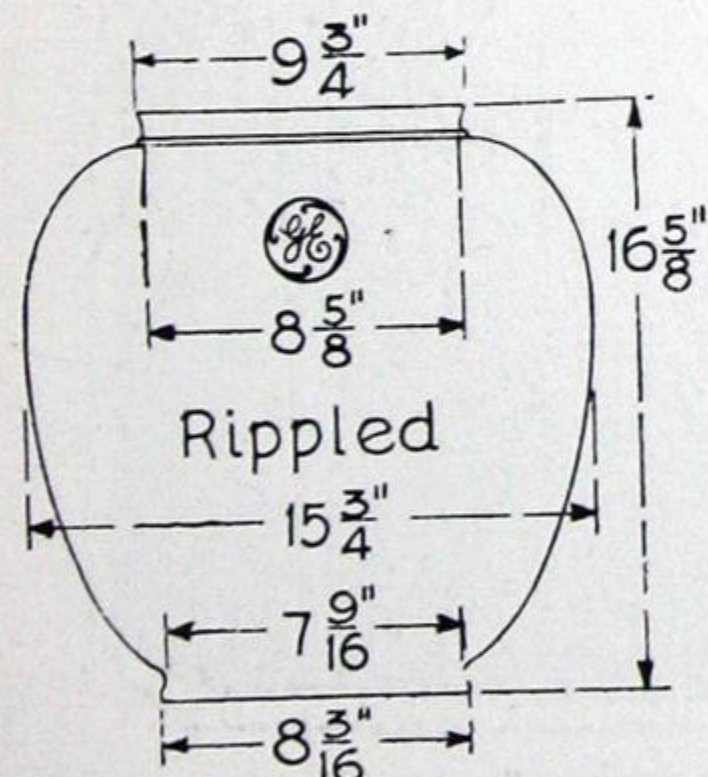
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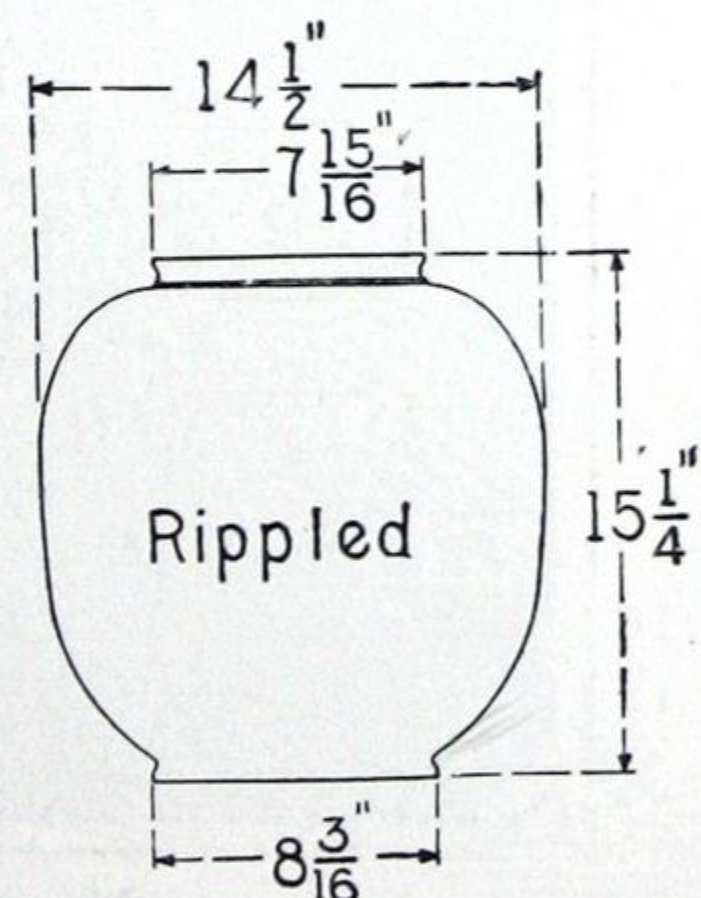
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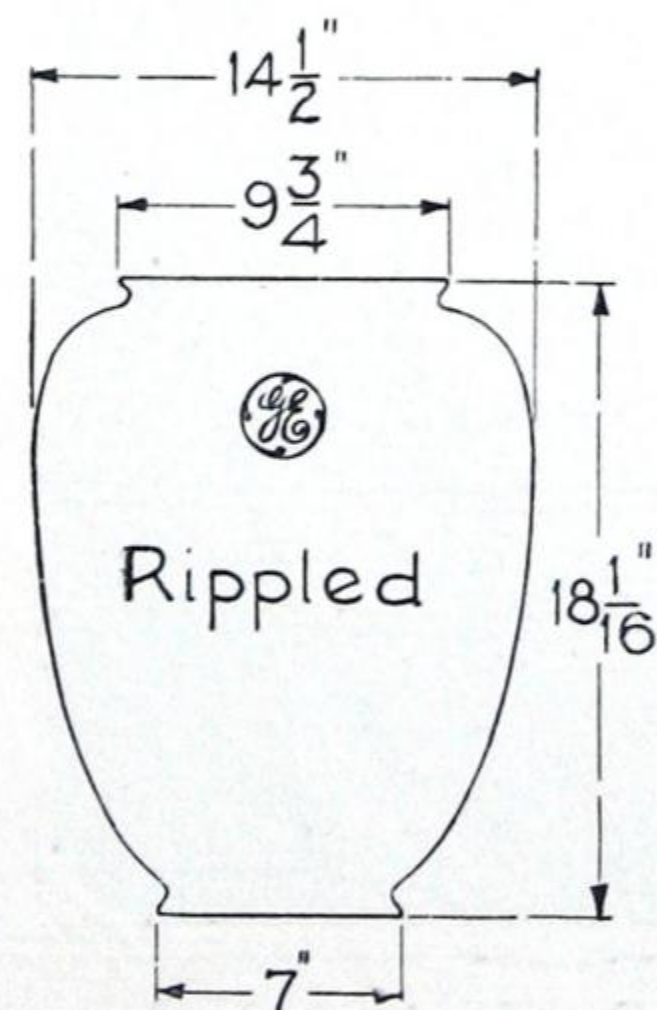
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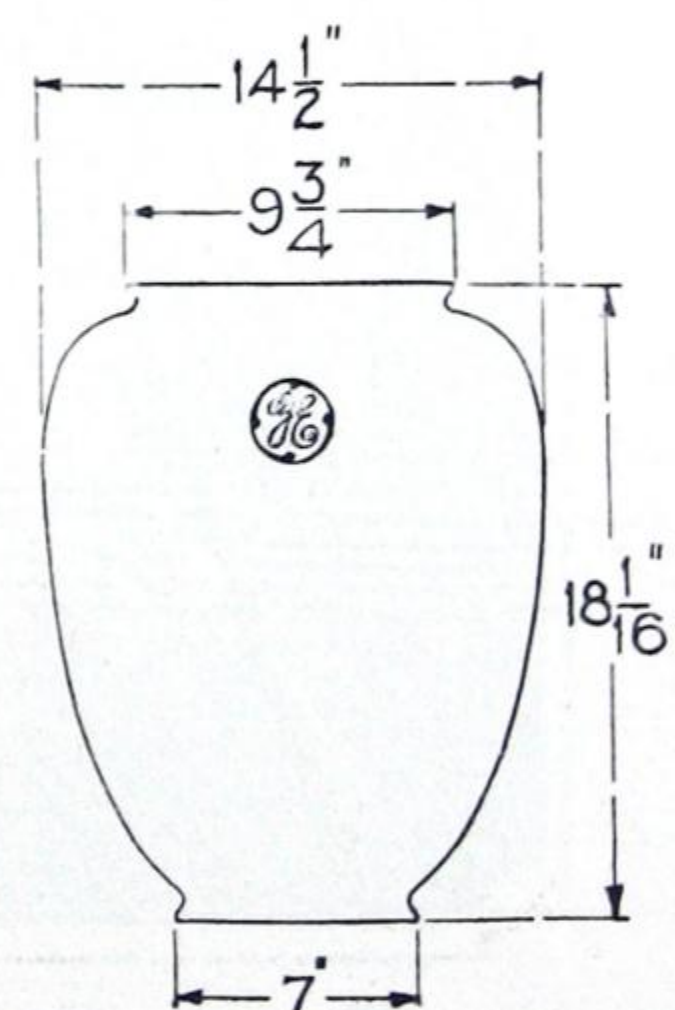
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No. 128



No. 138



No. 139

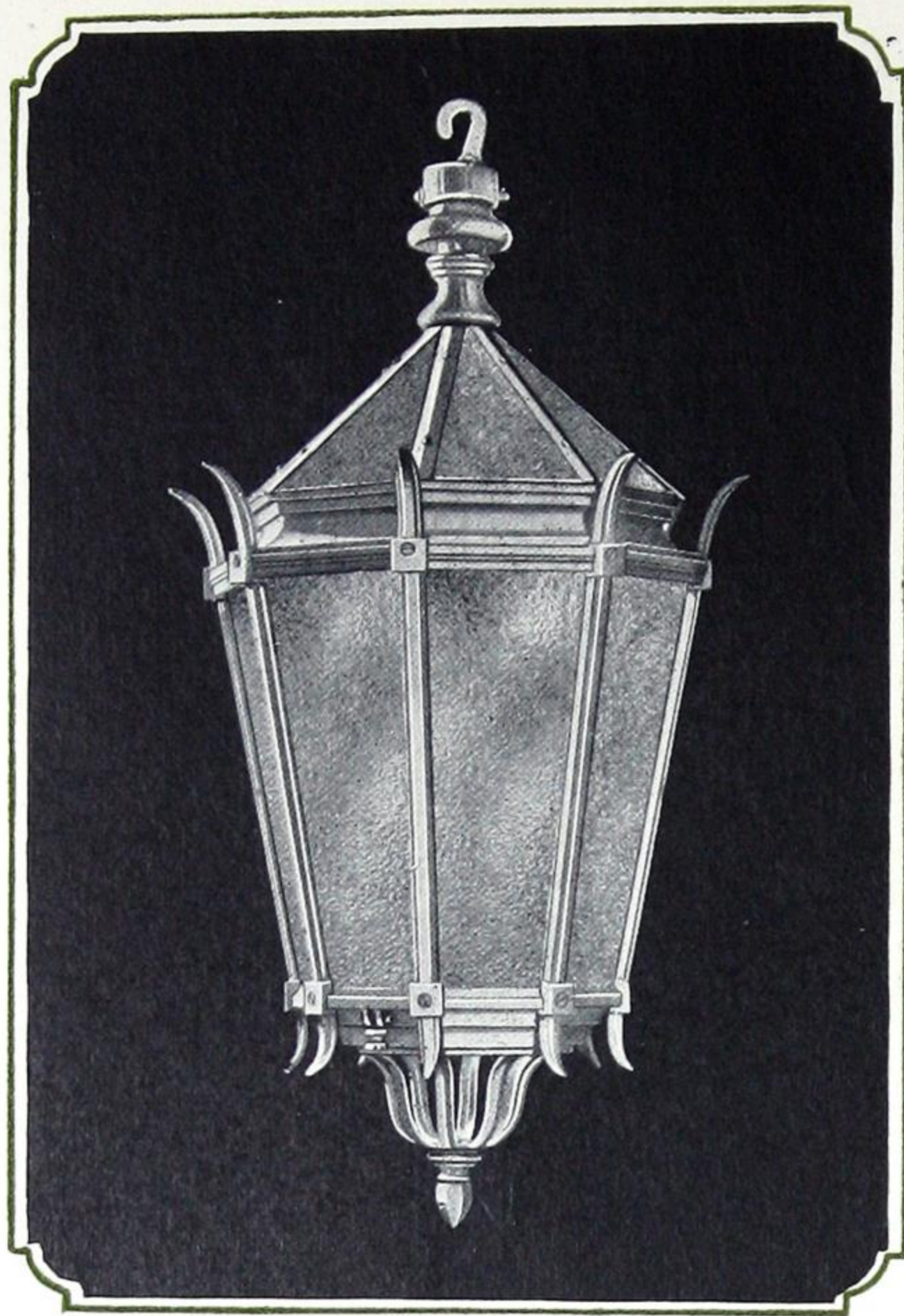


Fig. 19. Form 19 Pendent Lantern,
Showing Use of No. 114 Canopy,
Side, and Lower Panels

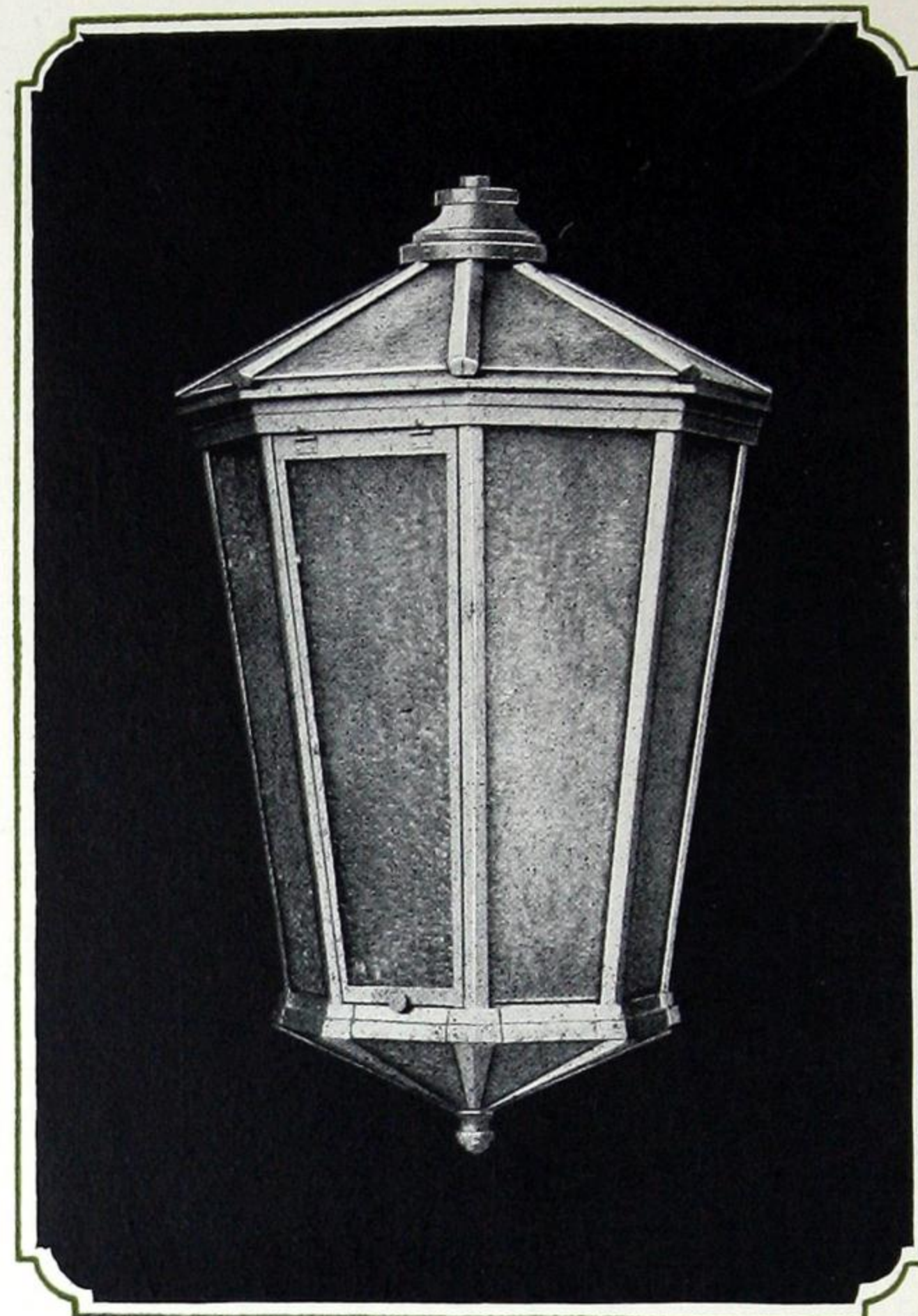


Fig. 20. Form 24B Pendent Lantern,
Using No. 122 Canopy, Door,
Side, and Lower Panels

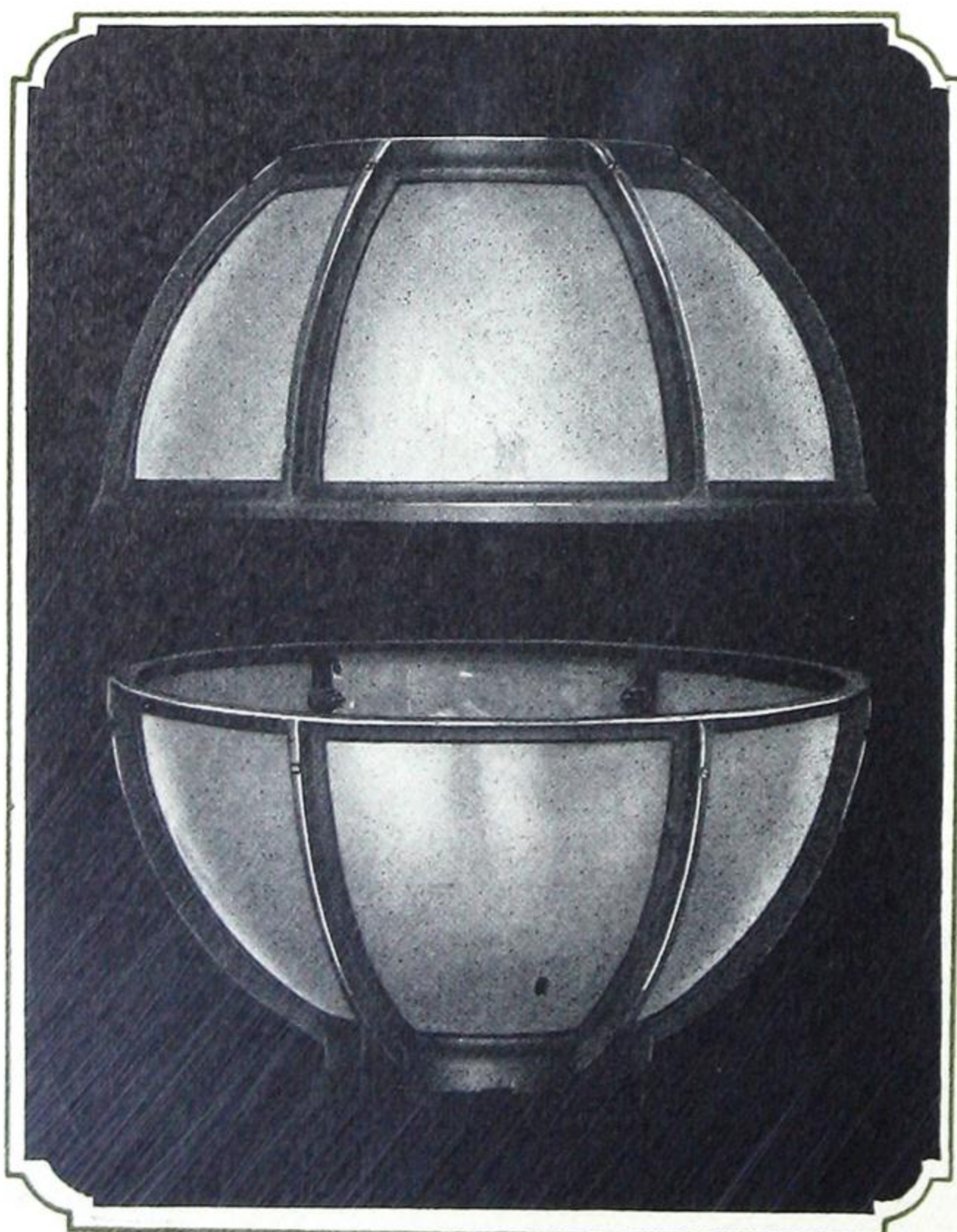


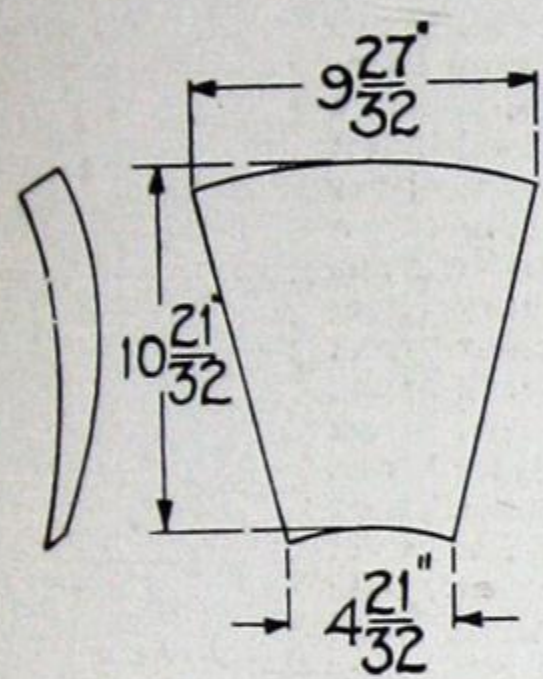
Fig. 21. No. 88 Panels Assembled
to Form Globe



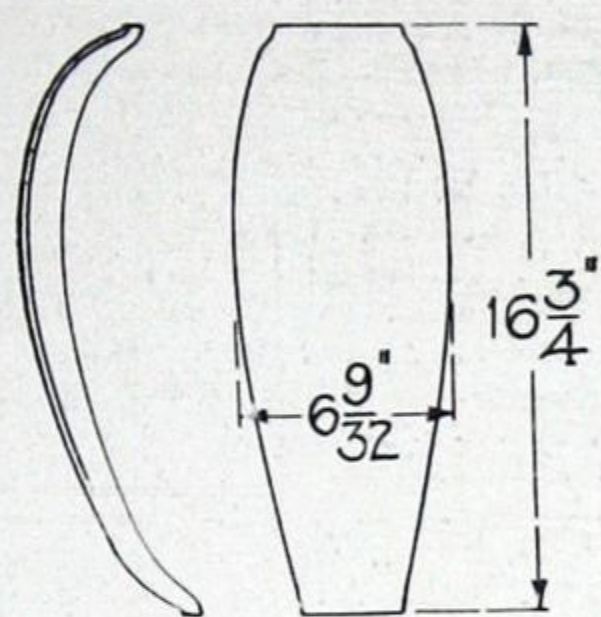
Fig. 22. No. 90 Panels Assembled
to Form Globe

G-E Glass Panels

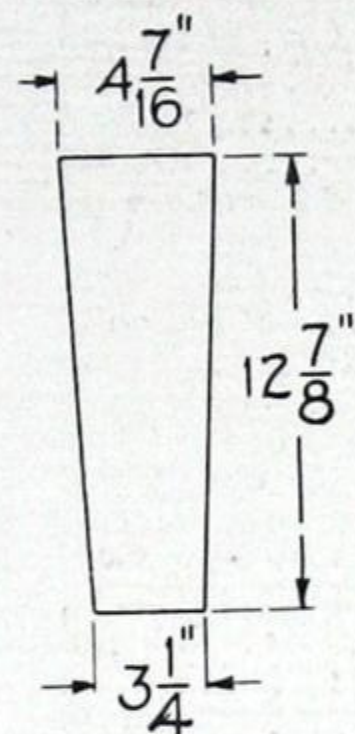
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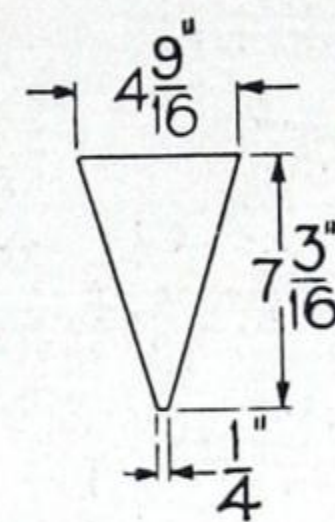
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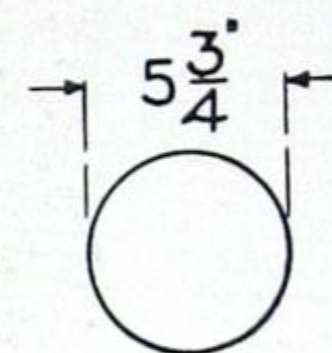
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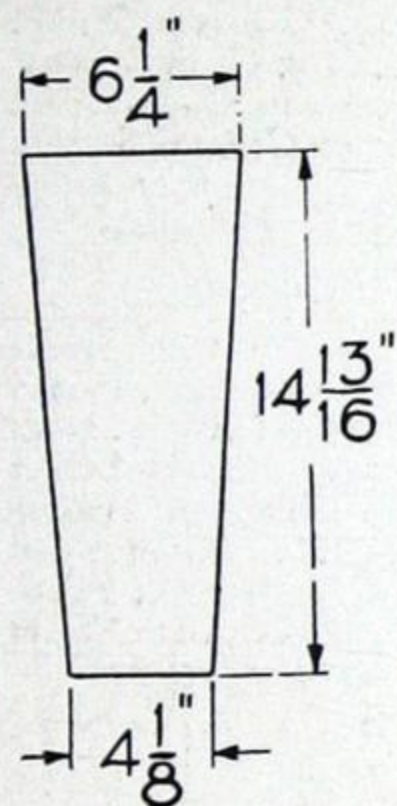
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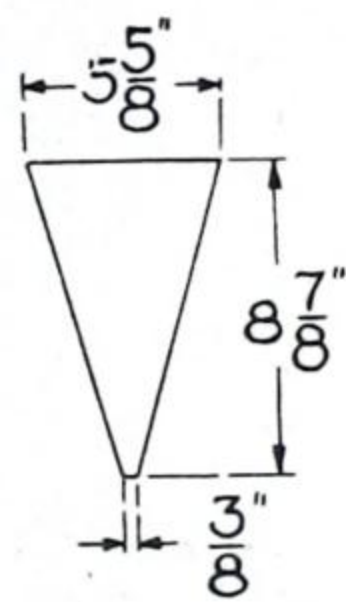
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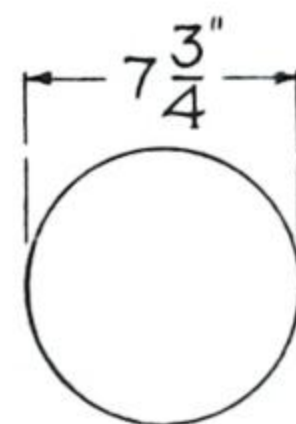
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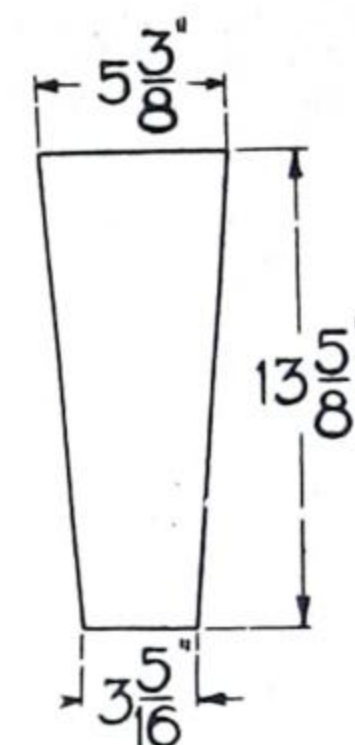
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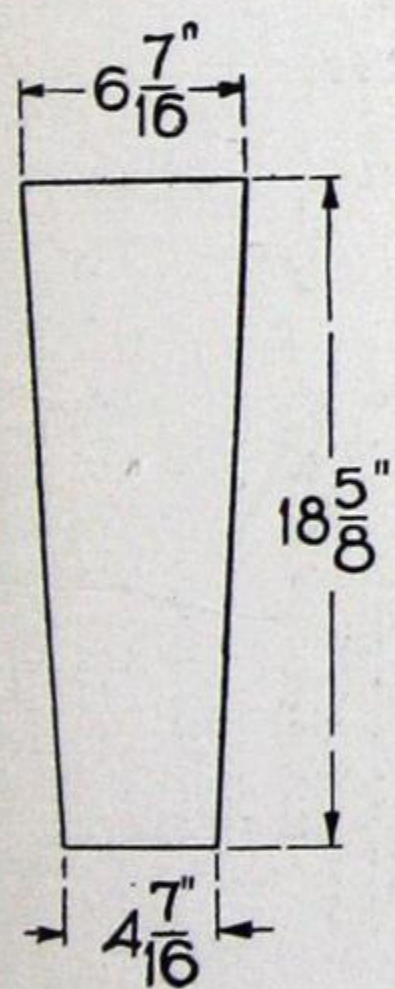
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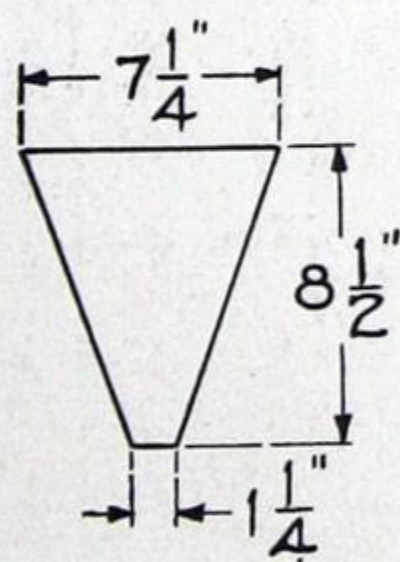
No. 115-L



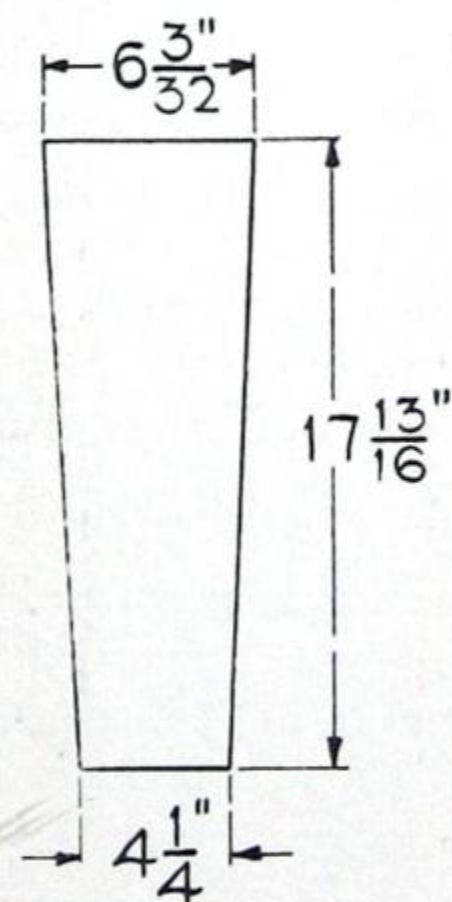
No. 121-S



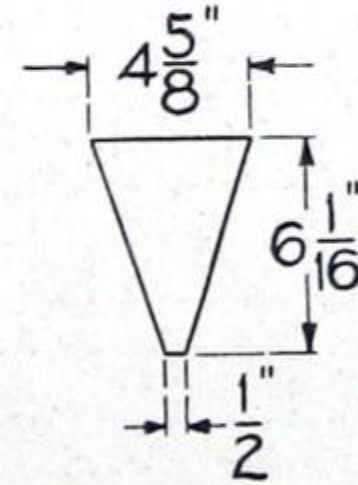
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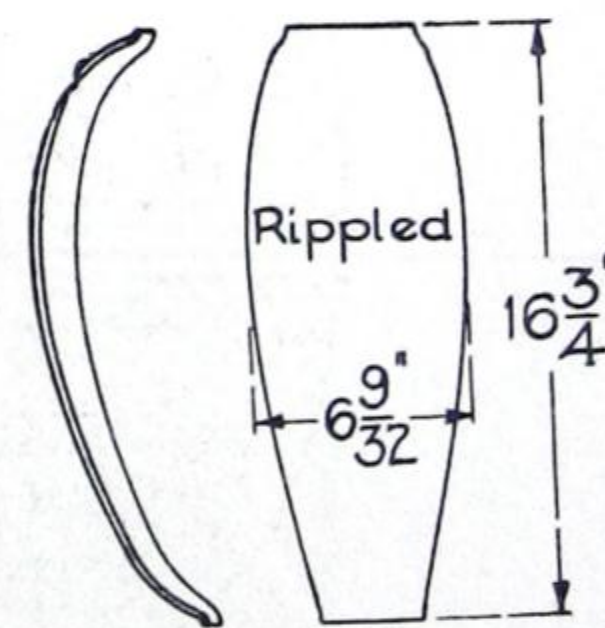
No. 122-C



No. 122-D



No. 122-L



No. 136

GENERAL ELECTRIC COMPANY

GENERAL OFFICE: SCHENECTADY, N. Y.

SALES OFFICES (Address nearest Office)

Akron, Ohio.....	159 South Main Street	Louisville, Ky.....	455 South Fourth Street
Atlanta, Ga.....	123 Spring Street	Memphis, Tenn.....	130 Madison Avenue
Baltimore, Md.....	39 W. Lexington Street	Milwaukee, Wis.....	425 East Water Street
Birmingham, Ala.....	2000 First Avenue	Minneapolis, Minn.....	107 Fifth Street, South
Bluefield, W. Va.....	104 Federal Street	Nashville, Tenn.....	234 Third Avenue, North
Boston, Mass.....	84 State Street	Newark, N. J.....	20 Washington Place
Buffalo, N. Y.....	39 East Genesee Street	New Haven, Conn.....	129 Church Street
Butte, Mont.....	40 East Broadway	New Orleans, La.....	921 Canal Street
Canton, Ohio.....	700 Tuscarawas Street	New York, N. Y.....	120 Broadway
Charleston, W. Va.....	201 Capitol Street	Niagara Falls, N. Y.....	201 Falls Street
Charlotte, N. C.....	200 South Tryon Street	Oklahoma City, Okla.....	1 West Grand Avenue
Chattanooga, Tenn.....	536 Market Street	Omaha, Neb.....	401 South 16th Street
Chicago, Ill.....	230 South Clark Street	Philadelphia, Pa.....	1321 Walnut Street
Cincinnati, Ohio.....	215 West Third Street	Phoenix, Ariz.....	11 West Jefferson Street
Cleveland, Ohio.....	925 Euclid Avenue	Pittsburgh, Pa.....	535 Smithfield Street
Columbus, Ohio.....	81 East State Street	Portland, Ore.....	329 Alder Street
Dallas, Tex.....	1801 North Lamar Street	Providence, R. I.....	76 Westminster Street
Davenport, Iowa.....	111 E. Third Street	Richmond, Va.....	700 East Franklin Street
Dayton, Ohio.....	25 North Main Street	Rochester, N. Y.....	130 Main Street, East
Denver, Colo.....	819 17th Street	Schenectady, N. Y.....	1 River Road
Des Moines, Iowa.....	418 6th Avenue	St. Louis, Mo.....	112 North 4th Street
Detroit, Mich.....	700 Antoinette Street	Salt Lake City, Utah.....	200 South Main Street
Duluth, Minn.....	14 West Superior Street	San Antonio, Tex.....	601 Navarro Street
Elmira, N. Y.....	338 East Water Street	San Francisco, Cal.....	116 New Montgomery Street
El Paso, Tex.....	109 North Oregon Street	Seattle, Wash.....	811 First Avenue
Erie, Pa.....	10 East Twelfth Street	Spokane, Wash.....	423 Riverside Avenue
Fort Wayne, Ind.....	1635 Broadway	Springfield, Mass.....	387 Main Street
Grand Rapids, Mich.....	201 Monroe Avenue	Syracuse, N. Y.....	113 South Salina Street
Hartford, Conn.....	18 Asylum Street	Tacoma, Wash.....	950 Pacific Avenue
Houston, Tex.....	1016 Walker Avenue	Terre Haute, Ind.....	701 Wabash Avenue
Indianapolis, Ind.....	106 North Illinois Street	Toledo, Ohio.....	520 Madison Avenue
Jackson, Mich.....	308 Francis Street	Tulsa, Okla.....	409 South Boston Street
Jacksonville, Fla.....	108 West Forsyth Street	Utica, N. Y.....	239 Genesee Street
Kansas City, Mo.....	1004 Baltimore Avenue	Washington, D. C.....	1405 G Street N. W.
Knoxville, Tenn.....	602 South Gay Street	Waterbury, Conn.....	195 Grand Street
Little Rock, Ark.....	223 West Second Street	Worcester, Mass.....	340 Main Street
Los Angeles, Cal.....	724 South Spring Street	Youngstown, Ohio.....	44 Central Square

Motor Dealers and Lamp Agencies in all large cities and towns.

For Hawaiian business refer to W. A. Ramsay, Ltd., Honolulu

SERVICE SHOPS

Atlanta.....	91 Glenn Street	Los Angeles.....	2330 E. 52nd Street
Chicago.....	509 E. Illinois Street	Minneapolis.....	410 Third Ave., North
Cincinnati.....	215 W. Third Street	New York.....	627 Greenwich Street
Cleveland.....	1133 E. 152nd Street	Oakland.....	5441 E. 14th Street
Dallas.....	1801 N. Lamar Street	Philadelphia.....	1223 Washington Avenue
Detroit.....	700 Antoinette Street	Schenectady.....	1 River Road
Erie.....	East Lake Road	Seattle.....	1508 Fourth Ave., South
Kansas City.....	819 E. 19th Street	St. Louis.....	1009 Spruce Street

BROADCASTING STATIONS

WGY, Schenectady, N. Y. KOA, Denver, Colo. KGO, Oakland, Calif.

Distributors for the General Electric Company outside of the United States

INTERNATIONAL GENERAL ELECTRIC COMPANY, INC.

New York City, 120 Broadway.

General Sales Offices, Schenectady, N. Y.

FOREIGN OFFICES AND ASSOCIATED COMPANIES

ARGENTINA: General Electric S. A., Buenos Aires
 AUSTRALIA: Australian General Electric Company, Ltd., Sydney and Melbourne
 BELGIUM AND COLONIES: Societe d'Electricite et de Mecanique (Procedes Thomson-Houston & Carels)
 Societe Anonyme, Brussels, Belgium
 BRAZIL: General Electric, S. A., Rio de Janeiro and Sao Paulo
 CANADA: Canadian General Electric Company, Ltd., Toronto, Ontario
 CHILE: International Machinery Company, Santiago, Antofagasta and Valparaiso; Nitrate Agencies, Ltd., Iquique
 CHINA: Andersen Meyer & Company, Ltd., Shanghai. International General Electric Company (General Office for the Far East excluding Japan and China) Shanghai
 COLOMBIA: Wesselhoeft & Poor, Bogota, Barranquilla, Medellin and Bucaramanga
 CUBA: General Electric Company of Cuba, Havana and Santiago
 DUTCH EAST INDIES: International General Electric Company, Inc., Soerabaya, Java
 ECUADOR: Guayaquil Agencies Co., Guayaquil
 EGYPT: British Thomson-Houston Company, Ltd., Cairo
 FRANCE AND COLONIES: Compagnie Francaise Thomson-Houston, Paris; International General Electric Co., Inc., Paris
 GREAT BRITAIN AND IRELAND: British Thomson-Houston Company, Ltd., Rugby, England; International General Electric Company, Inc., Crown House, Aldwych, London, W. C. 2
 GREECE AND COLONIES: Compagnie Francaise Thomson-Houston, Paris, France
 HOLLAND: Mijnsen & Co., Amsterdam
 INDIA: International General Electric Company, Inc., Calcutta and Bombay
 ITALY AND COLONIES: Compagnia Generale Di Eletticit , Milan
 JAPAN: Shibaura Engineering Works, Tokyo; Tokyo Electric Company, Ltd., Kawasaki, Kanagawa-Ken; International General Electric Co., Inc., Tokyo, Osaka
 MEXICO: General Electric S. A., City of Mexico, Guadalajara and Monterey
 NEW ZEALAND: National Electrical and Engineering Company, Ltd., Auckland, Dunedin, Christchurch and Wellington
 PARAGUAY: General Electric, S. A., Buenos Aires, Argentina
 PERU: W. R. Grace & Company, Lima
 PHILIPPINE ISLANDS: Pacific Commercial Company, Manila
 PORTO RICO: International General Electric Company, Inc., San Juan
 PORTUGAL AND COLONIES: Sociedad Iberica de Construccoes Electricas Lda., Lisbon
 SOUTH AFRICA: South African General Electric Company, Ltd., Johannesburg and Capetown
 SPAIN AND COLONIES: Sociedad Iberica de Construcciones Electricas, Madrid and Barcelona
 URUGUAY: General Electric, S. A., Montevideo
 VENEZUELA: Wesselhoeft & Poor, Caracas

